ELECTRICAL REVIEW

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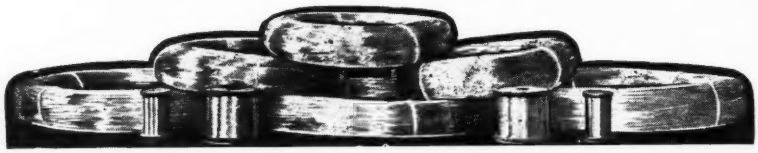

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ELECTRICAL REVIEW

Volume CXXX **No. 3358**

Friday, April 3, 1942

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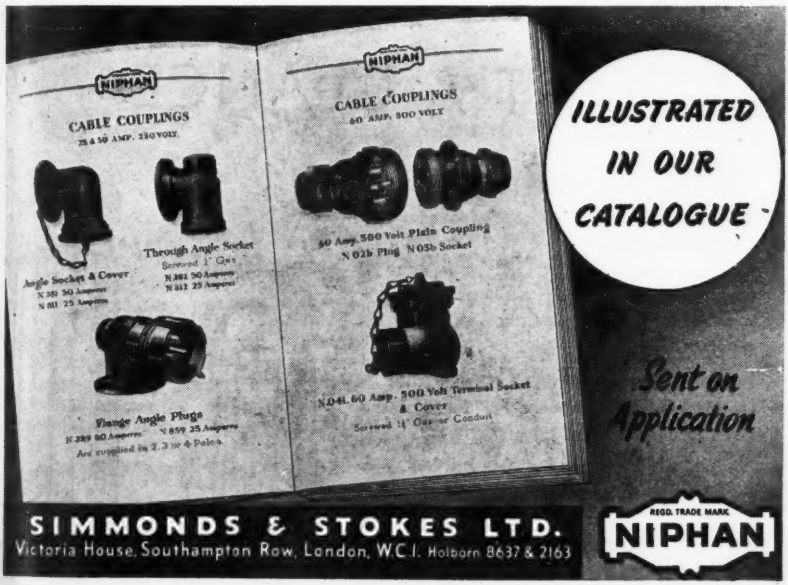
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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXX. No. 3358. APRIL 3, 1942 6d. WEEKLY

Conveying the Goods

Predominance of Electrical Methods

IN these days of intensive factory developments the problems associated with the handling of materials in and about the works, before, during and after process, are particularly pronounced, and the need for a broad review of the electrical aspects of the subject has been made very clear to us of late; hence the series of articles which we commence this week. Our investigation very soon revealed one particularly striking thing—that materials handling in one form and another preponderates throughout the whole of the manufacturing world.

We must confess that we did not fully realise this until recently, but our visits to a number of works have brought us a better appreciation of the outstanding importance of the subject, with its special significance in relation to the war effort, and with a very bright aspect too—the tremendous and almost exclusive part electricity has played and is playing in the development of materials handling.

Flexibility of Control

Where is the non-electrical counterpart to the modern heavy-duty steelworks motor, and how could the steelworks engineer envisage the manifold operations of the furnace charger as we know them to-day in any other way than as a manifestation of the essential flexibility of electrical control? Could the suspended self-contained power hoist be anything other than an incorporated-motor unit? And as to the ubiquitous works conveyor, it is taken for granted when laying down normal factory installations that only the electric drive can be considered.

Yet it is certain that this happy position would not have been attained if the electrical manufacturer had not played a leading part in the matter. The modern steelworks motor has been the subject of hard-going evolutionary development for many years past and it is still nowhere regarded as satisfactory in the sense of finality. Again, the electric truck and tractor are now taking a useful place in the materials-handling field, thanks to a large extent to improvements in battery-charging equipment.

Mass Production

What of the future? Within the limits of human probing there is little doubt that the greatest possibilities lie in the direction of sequence control, and this is directly coupled with the outlook on mass production. In spite of trade depression, a big step forward was made in mass production immediately after the last war as the result of the lessons learned from the sheer necessity of speeding up war production, and it seems logical that, with proportionate intensification due to the greater problems of reconstruction, something similar will happen after this war.

A good deal of prejudice must first be worn down, though, if we are to make the most of our opportunities. Ideas which couple mass production only with the "cheap and nasty" have got to be replaced by the proven ones which show that the most effective quantity production can

only be carried out with the highest quality materials and precision control. The electrical industry has the complete answer to the demands of both speed and control, and the automatic control of the feeding of the washing materials to the laundry washing machines, cited in the third materials-handling article, indicates what a vast field there can be for sequence and selective control once we can broaden our outlook beyond the confines of the belt and the elevator.

Gas-Electric Co-operation

IN the course of his speech at the annual meeting of the County of London Electric Supply Co. last week, Sir Robert Renwick referred to conferences with peace-time competitors in the gas industry aimed at discovering means of economising man-power and expense. For instance they felt that it was wrong in these times to maintain both gas and electric showrooms in their areas and it was hoped that in the near future arrangements would be made to co-operate in this direction. An attempt made by the company to combine the reading of gas and electricity meters proved abortive, apparently due to the unwillingness of the trade unions concerned to countenance the system, and the attention of the Ministry of Labour has been drawn to the matter.

International Electrification

WRITING to *The Times*, with reference to a recent article on world trade after the war, Col. T. H. Minshall, the electrical consultant, suggests that national boundaries restrict the advantageous development of public utilities—civil aviation, land transport, communications and electricity. He says that there is no reason why third-class passengers or electric voltages should change at frontiers. The railway and electrical systems of Switzerland, Holland, Belgium, etc., are too small for maximum efficiency and experience has shown that electric grids many times larger than the networks in these countries are desirable. Reference is made to the concentration of control by Germany of the Central European railways and Col. Minshall says that it is believed that the Todt organisation has already begun to design a Central European grid. He suggests that the possibility of setting up a post-war international organisation for the furtherance of such schemes. Nobody will deny the desirability of such co-ordination, but will the nations of Europe ever relax their "sovereign rights" to this extent?

A Common Fallacy

CROYDON Finance Committee proposes to take £27,000 from the Electricity Department's surplus for the rates and in criticising the opponents of the proposal a local paper says that the ratepayers provided the capital for the undertaking and are entitled to share in the profits. The fact is, of course, that capital is raised through the usual financial channels; the loans are secured on the rates, but the charges are paid by the consumers. The ratepayers, as such, are entitled to the return of any amount taken from the rates to meet a deficit (an extremely rare occurrence) but otherwise the consumers (who are also ratepayers) should receive benefit.

Clean Coal

CONSIDERABLE impetus would be given to the cause of efficient use of coal if a principal obstacle were removed at the source. The technique of coal cleaning was much in advance of its application at the collieries before the war, since when its advantages have become more obvious. In present circumstances, handling, transport, operation and maintenance of steam-raising plant and ash disposal, through having to deal with millions of tons of incombustible matter, present an urgent problem. Any additional labour incurred is demonstrably saved many times in other ways. The installation of new coal-cleaning equipment may be impracticable at present, but it is doubtful whether existing plant is employed to the fullest extent.

Efficiency in Use

IN urging economy in the use of electricity to meet the present coal situation, supply authorities are really only intensifying what has been part of a long-range policy of most of them. Just as their aim has been to generate for the lowest amount of fuel per kWh, so they have made a point of advising consumers how best to use electricity. This far-sighted attitude has in the past paid handsomely in ultimately increased sales. Unfortunately it cannot be taken into account in rationing, which will presumably be based upon a previous efficient consumption of electricity.

Handling Materials—I

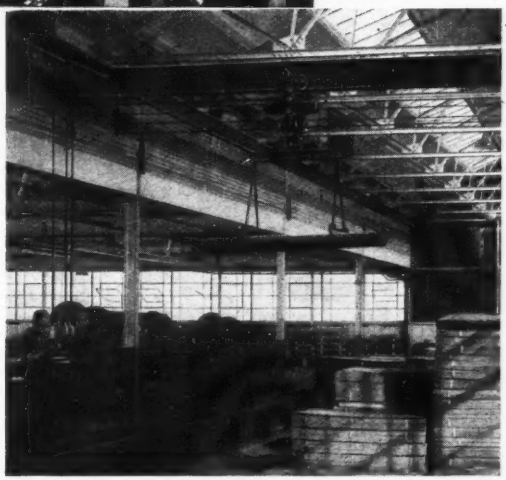
Heavy-duty Installations and Equipment

IN selecting the equipment to be dealt with in this, the first of our articles surveying factory material-handling equipment, we have described the various equipments referred to as "heavy duty" not only because of their size, mechanical loading and electrical power requirements, but also because of the conditions under which they operate, i.e., dampness, dirty and acid atmospheres, rough usage, etc. Thus, while a heavy-duty equipment may handle only a comparatively light load, and consequently call for only a small driving unit, it may have to run continuously for long periods with practically no attention.

A great advance has occurred in the design of steelworks motors; ingot stripping crane operated by two 50-HP and one 25-HP AC slip-ring motors

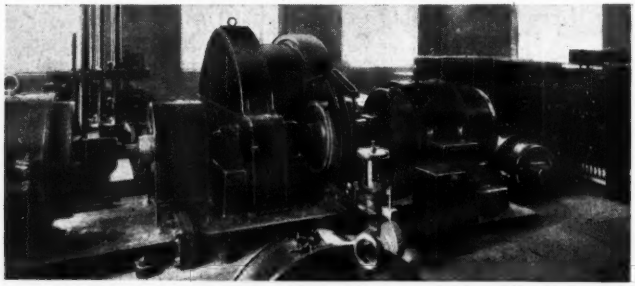
In thinking of heavy-duty equipment the electrical mind automatically turns first to the iron and steel industry and then probably to steelworks cranes. We feel that, apart from specified duties of loading, etc., the requirements of the overhead electric crane cannot be better stated than as enunciated by Herbert Morris, Ltd.: a proper balance between the unit loading on the gear-teeth, the optimum peripheral speed, the maintenance of good and continuous lubrication, quietness in operation by the diminution of vibration, the least possible "wear and tear," complete retention of the oil in the case, and reasonably small occupation of space.

The following notes relating to the Wellman Smith Owen overhead electric steelworks cranes give a general idea of the requirements for this heavy-duty service. According to the span and service conditions one of four types of girderwork are used, namely, roller steel joist, double-web box plate, two-girder lattice box section, and four-girder lattice. Each end carriage has two large-diameter special grade cast-steel double-flanged runner-wheels embodying roller bearings running on fixed axles secured to the webs. The motor for the long travel motion is mounted at the centre of the span and drives through double helical steel gearing, a large diameter cross shaft extending the length of the crane, supported by self-aligning ball-bearing pedestals pitched at close intervals. The



Where the loads are light the under-hung crane is useful

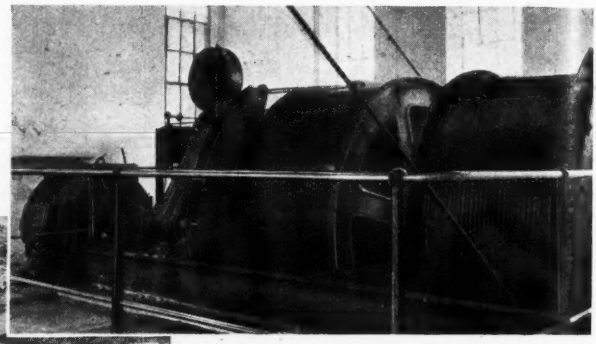
motor gear is enclosed in a substantial welded-steel oil-tight gear box to which is attached the motor bedplate and foot-brake seating, forming a rigid one-piece unit and ensuring the maintenance of perfect alignment under all conditions of loading.

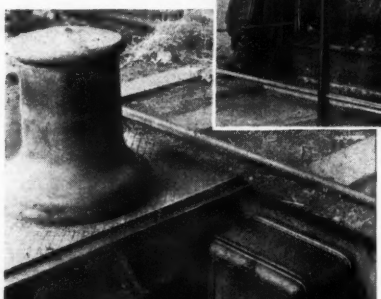


The new electric drive for a blast-furnace charger has resulted in considerable time-performance improvement; 3,500 tons in 21 hours—130-HP motor

The hoisting motion consists of a cast-iron barrel driven by one motor through suitable spur reduction gear. The barrel is grooved spirally right- and left-hand to ensure a true vertical lift. For cranes of ten tons and upwards the hoisting motion can be fitted with change-speed gears to enable lighter loads to be lifted at correspondingly higher speeds. The hoisting motion is fitted with a powerful automatic brake which comes into operation on current failure, while a self-resetting limit switch automatically trips when the hook reaches the high position. The cross traverse trolley is mounted on four double-flanged steel runners and one axle is motor driven through spur reducing gear.

A review of the developments of Bruce Peebles & Co., Ltd., in the design of totally enclosed, heavy-duty, intermittent rated AC motors for steelworks cranes, etc., reveals that a great advance has been made, the basis of which is characterised by the following principal considerations:—Structural stability and great mechanical strength, incorporating shock-resisting powers of windings to withstand the severe shocks resulting from sudden or rapid variations in load, coupled with frequent cyclic reversals; improved insulation to ensure freedom from softening, carbonisation, cracking or disintegration when the motors are subjected to high ambient temperatures; brushgear of self-contained unit construction; and large slip-rings to stand up to heavy current changes and conducted





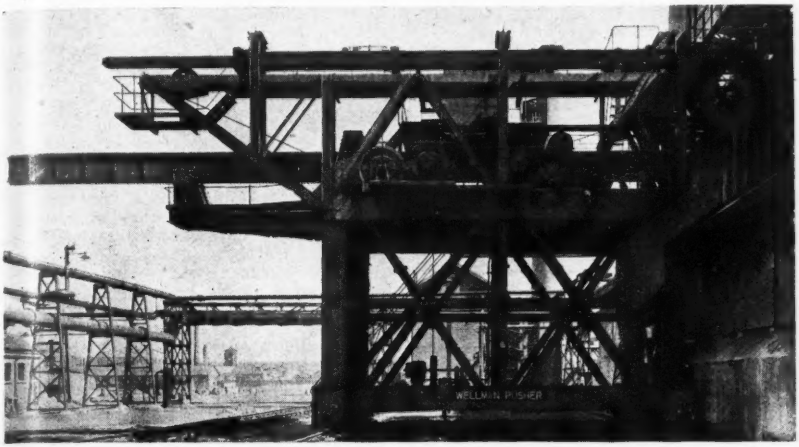
Above: The incline is served by a double-drum, double-geared haulage driven by a 350-HP, 3.3-kV, 720-RPM motor. Left: There is a tremendous field for the further development of the electric capstan; 30-HP standard-housing motor

vibrations. The motors frequently take two or three times the full-load current and in consequence the windings are subjected to mechanical stresses to a much greater degree than those of ordinary industrial motors. Special care is therefore taken to ensure that the windings are a good fit in the slots, so as to prevent the possibility of movement due to the heavy alternating stresses, while inorganic insulating materials are used as a precaution against fatigue and shrinkage.

Where the loads to be handled are relatively light the under-hung type of crane produced by Asea Electric, Ltd., is useful as the additional weight of the crane and runway does not add appreciably to the size or cost of the building steelwork. This crane employs a remotely controlled hoist block with power traverse as the hoisting unit. The pendant push-button controls are situated at one end of the crane, leaving the entire floor space free.

The following example is indicative of the strenuous conditions imposed on blast-furnace charging plant. The hoist is required to wind skips up a gradient of 55 deg. to a vertical height of 150 ft., and return empty in 45 seconds overall. The skips weigh six to nine tons loaded and four tons empty. For this drive a 130-HP, 660-RPM, compound-wound DC "Metrovick" motor is used, transmitting through a flexible coupling and a double reduction gear to a 6-ft. diameter drum at 17.5 RPM. The new electric drive has resulted in a considerable improvement on previous time performance and is capable of dealing with a maximum of 3,500 tons of material in 21 hours.

Closely allied to cranes in the iron and steel and allied industries is the lifting magnet which has proved of immense value as a time saver in the transportation of scrap and all manner of products—sheets, bars, etc., about the works. In one installation where crane-suspended magnets are used for lifting steel plates on to the feeding tables of plate shearing machines, etc., two-ton lift square magnets are employed and they are usually arranged in groups of three attached to beams, the generally convenient weight of plate which requires handling being about six tons.



The coke-oven pusher is a great achievement in multi-operational handling

Steel Furnace Charging

It is difficult to imagine more arduous working conditions in materials handling than those relating to steel furnace charging, in connection with which the performance of the electrical equipment is truly remarkable. On the charging side of the melting shop in one large works there are three Wellman low-ground chargers with under-floor collector gear, each with five separately controlled motions, the travelling being cared for by two series motors in parallel, and a 60-ton Broadbent and a 60-ton Babcock ladle cranes, all with 480/500-V DC mill-type motors, while in the casting bay there are two 150-ton Wellman and one 120-ton Craven ladle cranes, also fitted with mill-type motors.

The coke-oven pusher is another achievement in multi-operational handling of materials. One installation of 50 ovens levels the top of the coal immediately after it has been fed into each oven from the top, removes the heavy clamp on the oven door and slews it to one side, and pushes the coke

through the oven to be discharged on the other side after baking. The pusher is equipped with a 50-HP motor by which the complete equipment is propelled along one side of the whole oven battery, a 50-HP motor which drives the ram *via* heavy gear wheels and a rack on the ram arm, a 30-HP motor which serves the levelling arm, and a 5-HP unit by which the door extraction equipment is operated.

Underground Handling

The term "heavy-duty" can have no fuller meaning than when it is applied to the handling of coal underground.

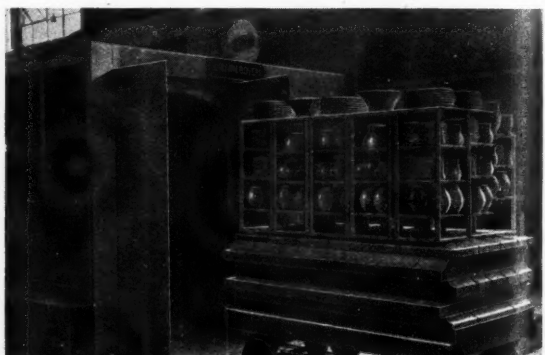
To commence at the actual coal face there is the now almost indispensable shaker-conveyor, and a model produced by Anderson, Boyes & Co., Ltd., measuring overall 15 in. high, 6 ft. 8½ in. long and 2 ft. 8 in. wide is suitable for both thick and thin seams. The two main components of the unit system—motor and gear case—are compactly bolted together and the heavy cast-steel frames of both afford high rigidity. The jigging action is obtained by driving an inside rocking arm from a crank, and external rocker arms are driven from the internal rocker arm by sleeves mounted in split bearings. The external rocker arms have two points of attachment for the connecting rod, thus permitting variations in the length of stroke to suit particular conditions of output and gradient. The 15-HP or 20-HP motor is either a s.c. or shunt-wound interpole unit with a high starting torque, the starting switch (which is of the contactor type for AC and the barrel type for DC) being mounted in a separate compartment in the motor casing.

For co-ordinating the conveyor handling at the face and the tub handling in the main haulages the gate-end loader is invaluable, and a good example is the A.B. belt-type gate-end loader. It is only 12 in. high and has three main components—the receiving end, the centre structure on which the road wheels are mounted, and the driving-unit and delivery end. The receiving end houses two large diameter return belt rollers which can be adjusted to ensure a true running belt. The motor and gear-box are mounted directly to the driving drum and the reducing transmission from the motor to the drum is *via* substantial worm gear.

Main haulages to the surface vary considerably according to whether the seams are won from vertical shafts or from inclines, but the winding equipments are similar. In the case of an incline installation, where length of haul is 2,000 yd. and the dip is about 12 in. per yard, the haulage speed is 6 MPH, and 20 trams each loaded with one ton of coal are raised at a time. The incline is served by a double-drum, double-geared haulage driven by a 350-HP, 3.3-kV, 720-RPM motor with a liquid controller. The empty journey is lowered with the main drum clutch disengaged to save time at a speed of 9 to 10 MPH.

Of the many instances in which efficient coal handling by the consumer results in increased thermal yield we refer to a Jenkins De Brouwer charging machine which is used to introduce coal into a retort, spreading the material evenly over the entire burning area. The coal is fed from a hopper into a travelling endless belt which projects the coal into the retort by centrifugal force. The distance of projection is altered by varying the motor speed, and hence the centrifugal force, and this is effected by an induction regulator, the motor being a 4-HP, 3-phase variable-speed commutator unit by Higgs Motors, Ltd., with a speed range of 750 to 2,000 RPM.

Quarrying operations involve some very heavy handling equipment and an outstanding example is the excavator at an ironstone quarry described in our last issue. This removes about 12 tons at a time from hard overburden up to 60 ft. deep, and dumps to 70 ft. high. Weighing over 600 tons, this mammoth excavator houses about 500 HP of motive equipment, including a m.g. set which supplies the DC Ward Leonard operated



Transporting materials during heat treatment is an exacting proposition; truck "placed" with pottery entering electric kiln

motors for hoisting, slewing and crowding.

There is a tremendous field for the further development of the electric capstan which is simple, takes up little room and will haul in any direction to a fixed point. We illustrate a capstan driven through worm reduction gearing by a 30-HP, 950-RPM, 3-phase protected s.c. motor by the English Electric Co., Ltd. As the motor is housed in an enclosed pit a standard type of motor housing meets the requirement. This machine has openings in the endshields and in the stator frame designed to give protection from accidental or careless contact with the interior, without materially obstructing the ventilation.

Transporting materials during heat treatment is an exacting proposition, and to take a very modern development there is the new electric biscuit and glost firing of pottery adopted by Josiah Wedgwood & Sons, Ltd. Trucks "placed" with pottery are run on rails continuously through the kiln end to end as a train, the whole being propelled by a pusher unit which operates with the end truck at the tunnel entrance. A small motor at floor level drives the pusher chain through a gear box and pinion gear with a very considerable speed reduction, while actual engagement between the chain and truck is by plates projecting from each. When the truck approaches the pusher gear a contactor is operated so that the pusher gear automatically starts up.

In surveying the various methods of handling materials we must not overlook the uses of media other than normal mechanical equipment—water and air, for instance. A particularly interesting example of the use of water in this way is the final separating of the metal after rock crushing, etc., in the tin industry. The principle is to cause the heavier tin to separate from the other materials as the mixture, suspended in water, flows over tables, through launders, in buddles, etc. The greater part of the tin is recovered on separating tables and these are responsible for the greater use of electricity.

The performance of the electrical equipment of steelworks furnace chargers is remarkable

Examples of conveyance by air are found in the cement industry, and in one case electro-pneumatic transporting plant is served by a 150-HP motor-driven compressor. Cement is blown by the compressed air (700 cu. ft. per min.) through a pipe line 1,400 ft. long to the storage silos.

Canadian Notes

AN order made by the Quebec Public Service Board empowers all public services to refuse electricity service for the operation of fluorescent, neon or other hot or cold cathode type gaseous tube lighting equipment which is not equipped with power-factor corrective devices so that the power factor of such equipment when in operation is not less than 90 per cent. lagging. These powers apply to all new installations as from February 1st, 1942. With regard to existing equipment where power factor correction has not been made, the public services will, after May 1st next, have the right to charge for the added cost of low power-factor supplies at special rates.

Mr. McNeely Du Bose, president of the Canadian Electrical Association, in an address to 250 delegates at the Association's winter convention, said that when the war started there was practically 1,000,000 HP available for war industry, thanks to the foresight of Canada's electrical utilities. With this as a start, they had been able to make the amazing increase of 22 per cent. during 1941 in the amount of firm power consumption in Canada. This was largely drawn from a more intensive use of existing apparatus, but not entirely, for last year electrical equipment was installed for an additional additional 250,000 HP. But that was not enough. Power demands were increasing and they still had the opportunity to increase their output by a further 500,000 HP from existing facilities. Their manufacturing companies were now producing generating equipment at the rate of 750,000 HP per year.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

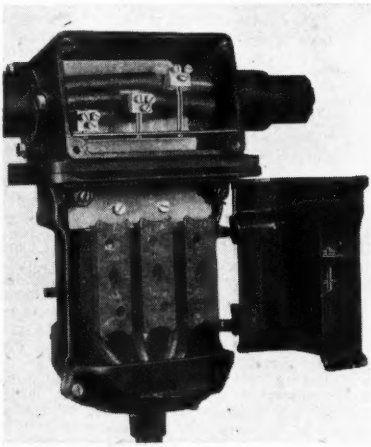
Switching Relay

A SENSITIVE relay with a switching capacity of 3 kW, known as the "Microwatt" is a product of ELECTRO METHODS, LTD., 112, Brent Street, London, N.W 4. It is constructed in an unusual manner, without a plunger and not needing to be tilted; instead, the magnetic field of a coil is employed to polarise two adjacent soft-iron brackets so that they repel, causing one of the brackets to dip into a pool of mercury. Contact is thus made in a way which avoids the possibility of sticking and, notwithstanding its sensitivity, the relay is strongly made, being suitable for temperature regulation and similar industrial control circuits, while it can be tuned to any frequency for remote control requirements.

Detachable Tee-Box

Economical positioning of feeding points in factory wiring layouts, which may be influenced by periodical machine shop modifications more than by possible future requirements, should be facilitated by an adaptable tee-box devised by BRITISH INSULATED CABLES, LTD., Prescot, Lancs.

It is assembled in two portions. An upper horizontal chamber with a removable front cover and screwed conduit nipples, which are interchangeable, contains mechanical claws with pinching screws for tapping v.i.r. cables drawn straight through in the ordinary manner. Bakelite partitions support and space these fittings and their tubular-copper vertically



B.I. detachable fused tee-box

downward connections into a detachable box with a hinged cover, which contains triple-pole English Electric high-rupturing-capacity fuses of the NS type (up to 20A at 440 V, three-phase), with insulated bases and carriers. The bottom outlet accommodates interchangeable glands for conduit or flexible metallic tubing, a grip type for tough rubber sheathed cable, or a plug socket of the Reyrolle or Walsall patterns.

Conduit chambers, being inexpensive, may be inserted at intervals as frequently as desired. The main cables need to be bared only for the claw tappings as and when fuses boxes are detached for bolting up elsewhere, or fresh ones are added. Thus adaptability to changing requirements is achieved with the minimum of sub-distribution boards. The system is safe and simple to install at any level, offering little obstruction to light when placed overhead.

Indication of Valve Positions

Positive indication of the settings of steam and fluid valves is often most desirable, showing at a glance the extent to which they have been opened, in which respect the "Arkon" position indicator is effectively visible from a distance of several yards. This simple mechanical device, a

"Arkon" valve position indicator

product of WALKER, CROSWELLER & CO., LTD., Whaddon Works, Cheltenham, Glos., will fit on to the spindle of any screw-down type of valve equally well either vertically or horizontally, the smaller sizes replacing the usual hand wheels, while the larger sizes may be attached to the tops of existing hand wheels.

A circular disc incorporates a dial graduated into twenty divisions with a pointer to which is attached a thin transparent sector coloured red. As the pointer moves around the dial it exposes a greater expanse of red sector to correspond with the opening of the valve.

Salving Sunken Cargo

THE *New Zealand Electrical Journal* states that the first sea tests have been made of a powerful electro-magnet for salving iron and steel from the cargo of the *Waikouaiti* off Dog Island, Bluff. The magnet consists of a metal casting 20 in. in diameter 8 in. deep and weighing 650 lb. The internal wiring has been carefully sealed to make it waterproof and the cable is shielded by a rubber hose. The power is supplied by a generator coupled to a motor-car engine. According to the specifications, the magnet will be effective for loads of up to six tons with a full margin of safety.

Incendiary-Bomb Detection

Device for Giving Immediate Warning of Impact

By E. Burke,
M.Sc., A.M.Inst.C.E.

VARIOUS methods of detecting the impact of an incendiary bomb on a building were dealt with in a Memorandum prepared by the I.E.E. Advisory Committee to the Ministry of Home Security (ELECTRICAL REVIEW, February 28th, 1941). This article describes a device which depends for its action upon the sound transmitted through the structure and fulfils the four requisites of giving an alarm immediately when (but only when) an incendiary bomb strikes the structure, reliability, ease of testing, and low cost.

Vibrations are picked up by one or more of a number of thin iron plates (24 SWG) secured to the roof and ceiling and transmitted along tensioned 18-SWG wires of galvanised iron or piano wires to a main plate to which a microphone is fixed. The microphone is connected in circuit with a battery and two relays, the second of which operates an alarm bell if the noise is of a certain type, *e.g.*, it is insensitive to gunfire and low-flying aircraft.

The wave form of the noise produced by an impact contains a large number of frequencies from very low to very high, whereas that produced by gunfire is deficient in the higher frequencies and so its effects can be eliminated by using a microphone with a very poor low-frequency response (usually one of the cheapest type).

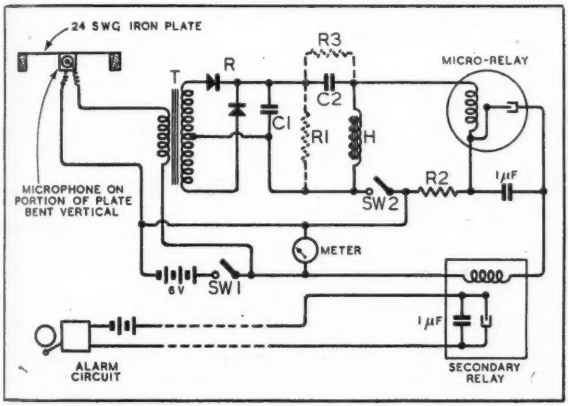
Noise produced by low-flying aircraft gradually increases in volume as the machine approaches and then gradually decreases as it recedes. Hence operation of the alarm by aircraft can be prevented by making the alarm sensitive to sudden noises only. This is done by rectifying the output from the secondary of the microphone transformer, smoothing somewhat by means of a condenser and then applying the resultant to a micro-relay through a condenser so that the deflection of the moving arm is proportional to the rate of change of voltage.

The noise from a bomb actuates the micro-relay, momentarily closing its contacts. This sends a surge through the secondary relay and through the resistance R2 (see circuit diagram). This resistance is in the micro-relay circuit and the potential drop across it causes a current to pass through the micro-relay *via* the choke H, which prevents the output from the rectifier being short-circuited. Thus a small surge through the micro-relay closes the two relay circuits permanently until switch SW2 is opened.

The moving system of the relay must have a very low moment of inertia. A closing current of 50 μA with a 1,000-ohm coil resistance and a very small moving coil is suitable.

The possibility of uncertain contacts in the micro-relay can be very much lessened by using a higher voltage in the secondary relay circuit and reducing the current with a resistance. As this portion of the circuit is seldom in operation it could be supplied from small grid-bias batteries.

The primary and secondary of the microphone transformer should match their respective circuits approximately. A midget choke of about 50 H is quite suitable, but its value should not be substantially less or sensitivity would be reduced. The resistance



Circuit diagram of incendiary bomb alarm

R—Full-wave rectifier.
R1—Resistance for reducing sensitivity (optional).
R2—Feed-back resistance for keeping relays closed.
R3—Resistance for increasing sensitivity (optional).
H—50-H choke
SW1—Battery switch.
SW2—Reset switch.
T—Microphone transformer
C1—0·5-μF condenser
C2—10-μF condenser

should not be high enough to cause difficulty in keeping the micro-relay closed. The secondary of a midget intervalve transformer is usually appropriate.

The ordinary inexpensive midget carbon-button microphone is recommended as it has a poor low-frequency response and it requires no additional filter circuits. The microphone diaphragm should always be vertical. The small metal rectifier is preferably designed for very small currents.

Views showing construction of detector

The miniature moving-iron milliameter on the panel of the detector illustrated has a full scale of about 20 mA and is arranged to work as a voltmeter. When the needle falls below a mark on the scale representing 5.5 V the battery requires recharging. If a test lamp is used instead of a meter a third switch is required to avoid running down the battery unnecessarily. The current taken by the microphone is approximately 50 mA.

If the alarm is to be in operation only during black-out hours it may be switched on by turning on switch 1 and then switch 2 and switched off by reversing the process. To stop the alarm ringing turn off switch 2, and to reset, turn it on.

It was found that simpler circuits than that described were sensitive to low-flying aircraft and that more complex ones containing filters were not necessary. Sensitivity can be increased by putting a resistance across the 10 μF condenser. This counteracts its response to sudden noises only to an extent that depends upon the value of the resistance. With a micro-relay having a 1,000-ohm moving coil a resistance of 5,000 ohms for R3 increases sensitivity considerably without excessively increasing its response to continuous noises. It seems inadvisable to reduce this resistance much below 5,000 ohms, and it is best to dispense with it if possible. Sensitivity can be reduced either by reducing the size of condenser C2 or by putting a resistance across condenser C1.

Two microphones, when required, can be connected in series with satisfactory results, but a circuit which is adjusted to a sufficient sensitivity to suit the more responsive microphone may be insufficiently sensitive for the other. In this case a resistance shunted across the former will establish a better balance. If the two microphones are connected in parallel the more responsive one will require a series resistance.

The device can be made extremely sensitive by short-circuiting the 10-μF condenser and leaving out the smoothing condensers and choke H. In one case where the microphone was fitted above the ceiling of the second floor a moderate tap with a hammer on the wainscoting of the ground floor operated the alarm, and so did banging a door anywhere in the building.

A detector of this type could be connected to an alarm bell on the premises and also a standard fire alarm connected with the fire station. The detector, of course, should not be connected to the fire station.

National Certificates and Diplomas

THE 1941 list of awards of national certificates and diplomas which we have received from the Institution of Electrical Engineers shows that the total for England and Wales was 1,012 and for Scotland 53; these figures compare with 1,275 and 48, respectively, in 1940. Unsuccessful candidates numbered 698 (against 882 in the previous year).

Last year's awards were as follows: ordinary certificates, 704; ordinary certificates endorsed, 1; higher certificates, 286; higher certificates endorsed, 21; ordinary diplomas, 39; and higher diplomas, 14.

Insulator Manufacture

Progress in the Use of Various Materials

THE INSTITUTION OF CHEMICAL ENGINEERS held its annual meeting in London on March 27th. The president (Mr. C. S. Garland) has been closely associated with the development of the use of steatite for the manufacture of insulators and in the course of his presidential address said he would try and dissipate some of the contempt which chemical engineers had entertained towards the products of the potter. The real pressure for improvements in the products of the ceramic industry had come from the electrical engineer. Great refinements had been brought about by the demand for ever higher quality porcelain to stand up to increasing voltages. The demand was for a truly homogeneous and highly vitrified insulator. The inclusion of the smallest air bubble in the plastic mass would reduce enormously the puncture voltage.

Advance in Porcelain Technique

Electrical bushings were increasing in size; for a 220,000-V line the transformer bushings were 10ft. high and 3ft. 6in. diameter, were tested to a flashover of one million volts and cost each as much as building a five-roomed workman's cottage. Loss by cracking in drying through the uneven extraction of water vapour was a very serious matter, and this led to the process of drying with wet air. To-day the electrical porcelain industry could supply as ordinary articles of commerce reliable products for voltages of 220,000 V.

The electrical industry had demanded the provision of many tens of millions of small specially shaped insulators, which could not be produced either in the quantity or with the necessary standard of accuracy by the established methods. The potter was forced to borrow from the engineer the press with steel dies for this manufacture. At first a piece of moist clay mixture of about the right size was cut off and pressed in the die. Later, the porcelain mass, after grinding, mixing, passing over magnets to remove particles of iron, and filter pressing, was dried down to a moisture content of some 15 to 18 per cent. This moist powder was then pressed in dies, the pressed articles were dried, trimmed and fired to vitrification. Oil was mixed with the moist powder and being extruded to the surface of the plastic mass gave perfect lubrication to all parts of the die. This increased the output from a single press from 1,000 to 8,000 per day. In spite of these advances the tensile strength of hard porcelain of the highest quality was relatively low, only some 400 to 500 kg/cm².

Turning to steatite, Mr. Garland said that, whereas the shrinkage of a hard porcelain article from the wet clay state to the fired article was of the order of 25 per cent., the shrinkage of natural steatite to the finished state after firing up to the hardness of quartz or topaz (some 1,450 deg. C.) was uniform and of the order of 3 per cent. Moreover, its tensile strength was much higher (800 kg/cm²) than that of porcelain.

At first articles turned from a natural stone were limited in size, as it was rare for completely flawless pieces to be found of total volume greater than a quarter of a cubic foot. There was also a very considerable amount of waste, the weight of the turned articles being, under the most favourable circumstances, only some 15 to 20 per cent. of the total weight of the washed stone. The soapiness and resistance to wetting of the powder rendered abortive all attempts to throw and turn on established pottery lines. But if a considerable proportion (60 to 70 per cent.) of the powder were fired to 900 or 1,000 deg. C., at which it lost its soapiness, it could be incorporated with a small proportion of felspar to produce a silicate with a high proportion of magnesium and a very small proportion of potassium (less than 2 per cent.). This product had a tensile strength almost equal to that of natural steatite and, moreover, insulators so made could be used in direct tension and would, therefore, be unpuncturable.

Steatite in Overhead Lines

The supporting conductors of the German electric railway from Nürnberg to Munich were the first that were hung directly on to ceramic steatite insulators. Large steatite insulators for the support of overhead line conductors were also produced and one of their most interesting adaptations was in an attempt made at Monte Generoso to measure the voltage of lightning flashes. The experiment only established that the voltage of the ordinary lightning flash was considerably in excess of 10,000,000 V.

In attempts to employ steatite in the same way as aluminium silicate, or china clay, for the pressing of small articles it was discovered that if the perfectly dry powder were pressed to some 300-400 lb. per sq. in. it became aggregated to a solid coherent mass sufficiently strong to be dropped off an automatic machine on to a band. This became the basis of the process properly known as "dry pressing."

Just as transmission at ever higher voltages had resulted in great improvements in insulating products, so had transmission at ever decreasing wavelengths (increasing frequency)

demanded a corresponding improvement. Porcelain had at high frequencies what was known as a "high loss" factor of energy through the insulators. Natural steatite offered a considerable advantage over porcelain in this respect, but the new synthetic magnesium silicate had the lowest loss factor of any product so far known.

Synthetic magnesium silicate had taken the place of mica to a very large extent in the construction of resonant circuits and many millions of components made to a very high order of accuracy and with a loss factor controlled within narrow limits were supplied for the use of the fighting services. It was the only material available for the insulation and reflection of micro-waves of lengths down to 1 cm., or frequencies up to 300,000,000 cycles per second.

The remarkable properties of synthetic magnesium silicate led to research into analogous compounds, amongst others the synthetic spinels and the compounds of magnesium and titanium. A study of their electrical properties had shown that there were three well defined magnesium titanates. Whereas magnesium silicate had a positive coefficient of capacity with regard to temperature, the magnesium titanates had a negative coefficient so that combination of magnesium silicate and titanate produced a zero temperature capacity coefficient.

Electro-deposition on Magnesium Silicate

One property of magnesium silicate of great interest to chemical engineers, which was already used in the electrical industry, was that it was possible to deposit on it a highly coherent layer of silver which could then be electroplated to any desired thickness with copper, and any other material might be deposited upon it, or metal parts attached by solder suited to the metal and the requirements. The material had other properties, such as hardness (between that of quartz and topaz), toughness represented by its resistance to fracture under impact, high elasticity, high compressive strength, and capacity to take a high degree of polish. In order to make full use of these properties, another radical change was made in the pottery industry. If the firing were stopped at about 900 deg. C. the resulting product, while so hard that it could readily be handled or worked, was soft enough to be treated like a non-ferrous metal. It could be sawn, ground, drilled, shaped, milled and gears and screws could be cut. Gears and bearings could be made from it and required only water lubrication; in fact, they could often be immersed in the liquid in which they had to work. Pump impellers could be made larger or, for the same size, could run at a higher peripheral speed; bearings could be as accurate and even more robust than case-hardened steel.

Finally, Mr. Garland mentioned that the metallurgical industry had adopted the method of dry pressing developed by the potter for the manufacture of small bearings and gear wheels, by pressing fine metallic powders together and sintering them. At present over 5,000 tons of metallic powder was pressed into metal parts every year in the United States, an increase of 25 per cent. over 1940, although the industry only started in 1936.

This process promised to have serious repercussions on the steel industry. There were extensive deposits of low grade iron ore (20 to 30 per cent) which it was not economical to use in the ordinary smelting processes. One of Ford's research engineers, Mr. Robert Boyer, had worked out a method for producing powdered iron by the electrolysis of ferric chloride obtained by the treatment of low grade ores by hydrochloric acid. This iron, which, because of its extreme purity, was soft and ductile, was said to resist corrosion better than ordinary smelted iron and was peculiarly adaptable to manufacture by the powder pressing process. No figures had yet been disclosed for the relative costs of the electrolytic process and the normal smelting of iron, but, having regard to the relative operations in the two processes, in which the powder metallurgy cut out the cost of smelting, the transport of coal, of casting, machining, boring, drilling, etc., it seemed that the cost of the electrolytic production of iron would have to be very high for it not to be able to compete on economic grounds.

The future importance to industry of these new processes of pressing dry powders created a need for closer study of the physical problems underlying the production and aggregation of powders of definite particle size.

Large Printing Press

WHAT is described as the largest individual rotary printing press in the southern hemisphere has been installed in Australia for the *Sydney Morning Herald*. The electrical equipment, manufactured by Witton-James, Ltd. (associated with the G.E.C.), will eventually include control gear for eighteen superspeed units (twelve of which have been installed) with six double folders, arranged in one line of twelve units with four folders and one line of six units with two folders. Each of the three double sextuple groups has six 60-HP, three-phase driving motors of the series commutator type with speed variation from 300 to 1,000 RPM, each with its brush-rocking motor, paralleling gear-box and shaft, and three-phase transformer. In addition an auxiliary 7-HP motor with wormgear freewheel coupling and an electro-magnetic brake is provided for "inching."

The switchgear is of the automatic contactor type with master and selector panels for combinations of press groupings, actuated by push buttons associated with coloured indicating lamps. Electro-dynamic tensioning regulators are provided.

Mechanical Draught

Fundamental Considerations Regarding Fans

By V. Smith, B.Sc.Tech.

FANS are essential auxiliaries on all but the smallest and cheapest boilers, for they result in the following advantages over natural draught:—Increased output for a boiler of given size or the use of a similar boiler to give the same output; better combustion, greater boiler efficiency and reduced fuel consumption for a given output; the permissible use of a much wider range of fuels and independence of atmospheric conditions.

Briefly put, the cost of fans is more than repaid by improved performance, whilst for large power stations the desired outputs and efficiencies could not be achieved without them.

The maximum height of a power-station chimney is about 300 ft., which with internal gases at 300 deg. F and external air at 60 deg. F would produce a natural draught of about 1.35 in. w.g. With gases at 400 deg. F the draught becomes 1.65 in. w.g., but the higher chimney temperature means a lower boiler efficiency. Thus, the draught produced even by a 300-ft. chimney severely limits performance, for two reasons. The first is that fires can only be thin, leading to low combustion rates and correspondingly small evaporations. Thick fires demand a draught of 1.0 to 2.5 in. to enable the air to penetrate the fuel bed. In practice, this means that generally only hand-fired furnaces employ natural draught. The usual reason is that modern air heaters and economisers cannot be used for lack of sufficient draught to overcome their resistance.

The applications of boiler fans are discussed and it is shown how they "pay for their keep" by improving efficiency and output

Correct Amount of Air

The object of using fans is often spoken of as the provision of draught, but this term, though a convenient one in the context of "natural" or "mechanical," "forced" or "induced," obscures the fundamental purpose, which is to provide the correct amount of air for efficient combustion at a pressure that will promote thorough mixing with the fuel, and to take away the gaseous products of combustion. Draught is merely the result of these operations.

Forced draught, whether for stoker, pulverised-fuel, gas- or oil-fired boilers, is usually delivered at the point of mixture with the fuel at a pressure of about 3 in. w.g., and secondary air for stoker-fired boilers at about 12 in. w.g. The fans for both purposes must, therefore, be capable of delivering the required quantity of air to the point of combustion at the correct pressure, after having overcome the resistance of the air heater and ducting, with its dampers and bends. The induced-draught fan must similarly be capable of dealing with a given quantity of flue gases and inducing a sufficient negative pressure at the fan inlet to overcome the resistance through the boiler passes, economiser, air heater, grit-collecting plant and ducting.

Whereas the forced-draught system starts at atmospheric (zero) pressure, it finishes at a positive pressure, whilst the induced-draught system starts and finishes at atmospheric pressure. In other words, the work of the latter is wholly concerned in overcoming the friction in its system when getting rid of the products of combustion, whereas the forced-draught fan not only overcomes the friction in the air circuit but delivers the air at a positive pressure, and the sum of friction loss and final pressure therefore determines its duty.

Another common impression is that modern boilers are designed for high speeds of gas and air flow. While it is true that the high efficiencies of air heaters and economisers are due partly to the high rates of heat transfer occasioned by the scrubbing action of the gases flowing over the heating surfaces, the velocity is sharply limited by the need to avoid excessive draught loss, which is found to rise as the square of the gas velocity.

It is more correct to say that draught loss, rather than gas speed, is the factor which limits the performance of these auxiliaries. With water-tube boilers it is usual to proportion the passes for gas speeds of 30 to 35 ft. per second, and about 40 ft. per second in the case of the gas and air ducts. For air heaters and economisers the speeds are somewhat variable and hard to determine, owing to the restricted passages, but they approximate to the above figures.

Draught-loss Determination

In short, moderate velocities prevail, these being sufficiently high to keep the various passages down to reasonable proportions yet low enough to avoid excessive draught loss. In designing a boiler, the order of procedure is to determine the sum of the draught losses, by well-established methods, and then to choose the fans to give the pressure or suction required.

An exception to the above rule of moderate speed of gas flow is found in the case of the

Velox steam generator. The speed of the gases passing through the tubes is of the order of 650 to 850 ft. per second, resulting in enormous heat transfer rates, but this is a highly specialised boiler in a somewhat early stage of development.

The two main factors with which fan performance has to deal are:—1. Volumetric capacity (usually given in cu. ft. per min.) or weight of gases handled (in lb. per hr.). One is readily converted to the other when the temperature of the gases is known. 2. The static pressure, or difference in w.g. between inlet and outlet.

To illustrate the range of boiler practice, the draught required for a small central heating boiler is about 0.1 in. to 0.18 in. w.g., whilst a Lancashire boiler operates with a draught of 0.375 in. to 0.5 in. at the firebridge. These figures are obtained with chimneys about 50 and 120 ft. high respectively. At the other end of the scale an example may be taken of a pulverised-fuel fired boiler of 300,000 lb. per hour capacity, where the following fans are employed:—

Type	F.D.	I.D.
Number of fans	2	2
Capacity each, c.f.m. ..	55,000	82,000
Static head, in. w.g. ..	7.0	7.7
Temp. of gases, deg. F. ..	85	250
Runner dia., in. ..	58	70
Motor BHP each ..	100	200
Maximum fan speed, RPM	940	720

The above fans are by no means the largest in service, but are an indication of representative practice on large boilers.

INSTITUTION PROCEEDINGS

Conflicting Regulations. *Scope for Irish Expansion.*

WHICH set of regulations should govern the construction of overhead power transmission lines on colliery premises? That was the question Mr. John McOwat (Robert M. Russell, Ltd.) endeavoured to answer in a paper submitted to the West of Scotland Branch of the ASSOCIATION OF MINING ELECTRICAL AND MECHANICAL ENGINEERS at Glasgow on March 14th.

Regulations drawn up by the Electricity Commissioners had hitherto been applied universally throughout the country, he said. Although they were generally acknowledged to be a sound basis on which to construct overhead power lines, they were not to be applied in future instances to such lines as were subject to the jurisdiction of the Coal Mines Regulations. The author could not appreciate the necessity for such a decree, which he considered retrograde; surely if the Electricity Commissioners' Regulations were insufficient inside a colliery yard they would be equally deficient elsewhere. A second set of rules could not be justified and he contended that the new draft regulations for coal mines should be altered to allow the Electricity Commissioners' Regulations to govern all overhead lines.

Colliery Power Lines

Strangely enough, the Committee which drew up the draft regulations did not intend to alter, or deviate from, the Electricity Commissioners' Regulations. It said so several times in its report, but in the process of "reproducing" them the wording, the meaning and the application had in some cases been altered; some parts had been amended and other parts omitted, which was perplexing. Overhead lines at collieries must therefore be hybrids, the sections on and outside colliery premises being required to conform to two different sets of rules, for which requirement the author failed to appreciate any justification. Following on this irrationality one would now be faced with the fresh problem of line demarcation at boundary crossings.

Other items required elucidation, for it appeared that the draft regulations demanded a continuous earthing wire for economic reasons and, furthermore, it must be of at least half the conductivity as well as half the strength of one of the line conductors, while all bonding wires on poles must also be of at least half the conductivity of the line conductor. These particular requirements were all decidedly more onerous, particularly in respect of conductivity values, than the equivalents asked for in El.C.R.53, which were surely quite adequate.

The wording of some parts of the draft regulations was too vague; for example, the precautions to be taken to minimise danger of broken line conductors were not specified. Acceptance of the definition of the word "danger" would necessitate "complete" protection by means of a continuous cradle of guard wires enclosing the line conductors. Presumably that form of construction was not visualised by the drafting Committee, since the cost involved would mean that no more overhead lines would be constructed on colliery premises. Similar lack of decision was apparent in respect of precautions against danger from lightning and other uninsulated conductors running down poles to within 10 ft. of the ground.

Without raising other minor points the author contended that there was no case at

all for the considerable departures from the Electricity Commissioners' Regulations which had been attempted. The latter should be adhered to, but not reproduced in the Coal Mines Regulations, otherwise automatic incorporation of amendments would not be assured. Should this appeal fail then the author would suggest reconsideration of the draft rules with a view to the removal of doubt by more precise specification in each instance of protective legislation.

A reform for which the author pleaded was the compulsory provision of an insulated stand, or platform, for the operator at every switch handle, which should also be insulated, mounted at ground level. An additional safeguard against the ground surface voltage gradient danger would be the earthing of the metal work of switches to a continuous wire, without earth plates at the switch poles, so that fault current would be conducted to earth remotely from the operator. An insulated switch handle alone was not sufficient safeguard when an earth plate was fitted at the pole. Under certain quite normal conditions the voltage gradient at the surface of the ground due to current radiating from the earth plate at a pole would create a potential difference between the operator's feet (spaced 2 ft. apart to secure proper purchase for actuating a switch) sufficiently great to be fatal.

Supply in Eire

RURAL electrification in Ireland was discussed by Mr. J. C. Costello in an address delivered at the Irish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS in Dublin on March 19th. In the course of this, the speaker pointed out that less than 30 per cent. of the entire population was supplied with electricity and less than 10 per cent. of the rural population (in towns and villages of less than 1,500 persons) enjoyed the benefits of electric light. Of the farms, isolated country dwellings and villages of less than 500 persons, about 1 per cent. received electricity; less than 1 per cent. of the farms were supplied.

Eire's modest consumption did not exceed 116 kWh per person. If all farms were electrified the estimated requirements would be 207,000 kW, or nearly twice the entire demand of the whole country (including cities and industries) in 1941. The consumption of farms might be estimated at not less than 1,255 million kWh per annum, or more than 3.5 times the total supplied for all purposes last year.

The most striking application of electricity to agricultural production was in respect of young grass and grain drying; the same equipment could be employed for both purposes and it rendered the harvest almost independent of the weather. Mr. Costello pleaded for immediate large-scale rural planning and general furtherance of electrical development as part of a social betterment plan. To reach 75 per cent. of the population upward of 50,000 miles of branch high-voltage distributors would have to be erected and perhaps 100,000 small distribution transformers installed, apart from switch and fuse gear. One of the first essentials would need to be the standardisation of a few varieties of materials, and there was no good reason why a large proportion of their requirements should not be economically and advantageously manufactured in Eire. The larger the scale on which such work were undertaken the more economic it would be. New Zealand with half the population of Eire had found it economic to spend up to £1.5 millions per year on rural work alone.

Mr. Costello advocated the abolition of fixed charges for electricity. He preferred to substitute a graduated charge per kWh designed to offer " discount for quantity," and favoured also the treatment of small business premises on the same basis as domestic households.

Mr. A. Burke considered that five different types of distribution lines would be required. He disagreed with the suggestion that they should be erected along roads, which would no doubt please the farmers. Mr. R. N. Tweedy said that they could not hide the fact that Eire was at the " bottom of the ladder " so far as electrical development was concerned. They, as engineers, had no influence whatever; the only people who were capable, but never willing, were members of the Dail. They had no intention of finding the money for completing what the Electricity Supply Board was set up to do, and would refuse to do anything of the sort outlined by Mr. Costello. In addition to what they paid for energy, consumers of electricity were being taxed at the rate of £400,000 a year by the " revenue hunting " authorities.

Frequency Measurement

SOME of the means by which frequencies may be measured with accuracy, in respect of the increasing rigidity of control that has become a necessity in view of the narrowing tolerances imposed on stability in all forms of telecommunication, are outlined in the paper by Messrs. J. E. Thwaites and F. J. M. Laver (Radio Branch, P.O. Research Station) submitted to the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on April 1st.

The main portion of the paper consists of a review of methods of measuring frequency, first below and then above 16 kc/s, proceeding to the generation of standard harmonic series produced by processes of division and multiplication. Choice of methods and respective accuracies obtainable are summarised

and the paper concludes with brief descriptions of some practical examples of measuring apparatus and a bibliography of twenty-nine references.

While there is scope for considerable skill, ingenuity and resource in making measurements of this kind, many of them are either of a routine nature or are needed as part of some production process. For such purposes special care in design will be repaid by ease of operation. The apparatus should be simple and not require the operator to recognise obscure heterodyne notes, nor should great delicacy of touch be needed for making adjustments. To reduce the possibility of errors the measuring scales should be direct-reading, clearly engraved, decimally divided and well illuminated, and reference to calibration charts or curves should not be necessary. The result should be obtained with the minimum of calculation. In apparatus based on the measurement of the difference in frequency between the signal and an adjacent standard harmonic, the difference should always be measured from the lower adjacent harmonic.

Harmonic Generator Requirements

Apart from the greater probability of errors in subtraction than in addition, uniformity of procedure is desirable. The difference frequency should preferably be indicated by a direct-reading meter, and if necessary it should be possible to use the apparatus with a recording meter. In order to increase the reliability of the harmonic series and to give confidence to the operator, the harmonic generator associated with the standard should be unable to operate on incorrect orders of division, and thus generate spurious reference frequencies. For this reason the use of the regenerative modulator type of divider with a distorter type of harmonic producer is recommended. The harmonic spacing should be variable in decimal multiples of 1 kc/s, at the will of the operator. When several measuring sets are used in the same laboratory the harmonic generators should be common, as it is then more economical to use the more complex, and more stable, types of circuit.

For ease of operation and to prevent waste of time the measuring apparatus should not require a long " settling down " period after first switching on, or after a change of range. It should be all mains-operated and not depend for its accuracy upon closely regulated battery supplies, and should incorporate range-switching devices. This consideration does not, however, apply to frequency standards, which should operate continuously and should be rendered independent of mains failures by being run from secondary batteries of ample capacity.

For ease of maintenance the apparatus should use as few valves, of as few types as possible, and components of ordinary quality, not relying for its accuracy upon the use of high-grade components. Critical adjustment or alignments should not be necessary. It should be simple in circuit layout and in mechanical construction, all parts being accessible. For flexibility in use, the apparatus should be capable of making rapid approximations as well as more accurate measurements.

Quality Control

A JOINT meeting of the Institutions of Electrical, Civil and Mechanical Engineers for discussing " The Application of Statistical Control of the Quality of Materials and Manufactured Products " as of immediate benefit in the output of munitions of war has been arranged for Wednesday, April 15th, at 2.30 p.m. It will be held in the Great Hall of the Institution of Civil Engineers, and the chair will be taken by Sir Noel Ashbridge (President, I.E.E.). The subject will be introduced by Dr. C. G. Darwin and Sir Frank Gill. The Minister of Supply, the Rt. Hon. Sir Andrew Duncan, has promised to be present.

For some fifteen years a new technique for handling problems, involving the control of the quality of manufactured products by the application of statistical methods, has been developed in this country and, independently, in the United States. These methods can now be applied in a simple form which, it is claimed, will entail no fall in output during their initiation and will quickly result in an increase in the quantity of the accepted product. This claim is supported by results in factories where statistical control has already been adopted.

The underlying theory is described in B.S. 600-1935 (5s.). The practical application will be found in concise form in B.S. 1008-1942, and in an interim revision of B.S. 600 (3s. 6d. each). The document B.S. 1008 is a reproduction of an American Emergency Defence Standard. Abstracts of the opening speakers' remarks and tickets of admission (not restricted to members) are now obtainable from the Secretaries of the Institutions.

Weld Inspection

TO the half dozen memoranda already issued by the Ministry of Supply Advisory Service on Welding there has been added No. 7, which is concerned with the inspection of work that has been arc welded. The procedure recommended in this eleven-page booklet, containing many sketches, provides a common basis of comparison by examination to aid different inspectors in maintaining the required standard of work. Copies are obtainable free of charge from the Advisory Service on Welding, Department of the Controller-General of Research and Development, Ministry of Supply, Great Westminster House, Horseferry Road, London, S.W.1.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Proposed Rationing of Electricity

THE proposal outlined in Mr. A. P. MacAlister's letter in your current issue has been discussed by representatives of electricity supply authorities for some time, but he does not appear to have given it quite correctly. The approach was as follows:—What do we do to encourage consumers to use more electricity? We reduce the charge per unit as consumption increases. Very well, reverse the process, increase the charge per unit as consumption increases, and it is expected that a reduced consumption will result.

The suggestion for putting this into practice was to charge beforehand for a percentage of the units at a higher rate and give a rebate at the end of the year according to the economy effected. This was calculated to cause consumers to economise in order to obtain the rebate. All this appears to be very simple, but would entail a considerable amount of work and we have not, and cannot get, the staff to deal with it, and further, it was pointed out that we should be creating a " black market " in electricity, as people with ample means would still use the electricity at the higher charge and it would be difficult to prevent it.

We have pressed for the strictest economy in the use of electricity for all purposes other than required for the prosecution of the war and have been complimented on our results by the committee conducting the Government's fuel economy campaign and we know from our statistics that the majority of consumers are economising to the full. There may be a few who are not playing their part and with a view to bringing these consumers into line it was suggested that the meter readers could keep a watchful eye and admonish the wasters to be more careful in future.

However, we feel sure that when Sir William Beveridge has all the facts and figures, a man of his accomplishments will agree that rationing is not worth while, but we should continue to do all we possibly can to ensure that consumers continue to economise and if at all possible they should further reduce their consumption.

*Battersea, S.W.*11. H. F. J. THOMPSON.
General Manager & Engineer.

REFERRING to Mr. MacAlister's letter on the above subject in this week's issue, I wrote in exactly the same sense to Sir Wm. Beveridge on the 18th. I thought it at the time a very good idea and I still think so in some ways, but it occurred to me that the objection might be that there was one law for the rich and one for the poor. Whereas a well-off individual might be able to afford two shillings, or even three shillings, per unit consumed in excess of his allowance, this would be prohibitive in the case of the working classes.

The matter is, of course, full of difficulties, not the least one of which is the inability of the ordinary person to read a meter.

*London, E.*17. E. N. BRAY.

Short-Circuit Currents

THE author of the article dealing with this subject suggests that switchgear manufacturers should give the matter closer attention. This I feel is not justified, because the size of the cable is usually determined by the mains engineer.

If Mr. Beavis will refer to papers read by Mr. J. R. Beard before the I.E.E. in 1916 and by Mr. E. B. Wedmore in 1918 he will find the subject fully covered. I can assure him that since that date the requisite co-ordination has been carried out on many undertakings. Examples to the contrary exist, however, and a few years ago the advertisement columns of the ELECTRICAL REVIEW revealed a photograph of a 250-MVA, 6.6-kV, metalclad board, one circuit of which was clearly labelled as being connected to a 0.1-sq. in. cable or some equally inadequate size. This caused some amusement at the time because the firm in question had just brought into use its short-circuit testing station.

Salford. S. R. MELLONIE,
Distribution Superintendent.

" Gratuitous " Distribution

IN the March 27th issue you have thoughtfully reprinted for the information of your readers the portion of the wording of the Control of Paper No. 36 Order dealing with the distribution of advertising matter, but to earn the real gratitude of ourselves and presumably of other readers, perhaps you could ascertain and publish the meaning of the said wording. Dictionaries give two meanings for the word " gratuitously " which may be briefly differentiated as : (1) unsolicited; (2) without monetary payment.

It seems clear that no " advertising circular " printed after November 12th, 1941, can be distributed to the usual mailing lists, *i.e.*, unsolicited, except to wholesalers and retailers (unless, that is, it is a diary of the type described). It is by no means clear, however, what must or must not be done in regard to specific requests that a catalogue or other advertising matter should be sent.

If " gratuitous " means " unsolicited," then

there is no objection to their distribution free of charge of charge in response to such requests, but in para. 6(2) (*d*) and (*f*) reference is made to certain classes of " circulars " sent " in response to a request," and it may perhaps be inferred from this that with regard to trade catalogues the other meaning of gratuitous is intended, namely, that a charge should be made for them.

Para. 12 (1) excludes " any act necessarily performed for the purpose of fulfilling any contract made with the Crown," and apparently makes it unnecessary to make a charge to a Government Department. Would this also cover firms working on Government contracts who require catalogues of industrial equipment for use in their own works in connection with carrying out such contracts, and what of railways, municipalities, power stations, etc., who are maintaining the services essential to the life of the community, but who have no contract number which they can quote?

Users of these classes more often purchase direct from the manufacturer than through retailers or wholesalers, and to charge them for catalogues would appear to increase the consumption of paper rather than economise it, as it is unlikely that the charge would deter them from obtaining the catalogue if they had once decided that it was necessary for them to have it, and invoices, receipts, envelopes, etc., would be expended. All this would apparently apply to a single-page leaflet weighing less than the invoice, etc., relating to it. It is difficult, therefore, to believe that this meaning of " gratuitously " can really be intended, but it would be convenient for us and presumably many others if a ruling could be obtained.

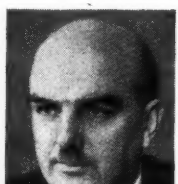
Mitcham. DOUBLE ENTENDRE.

PERSONAL and SOCIAL

News of Men and Women of the Industry

A NUMBER of prominent educationists, among them **Dr. A. P. M. Fleming,** of the Metropolitan-Vickers Electrical Co., Ltd., are members of the Committee appointed by the President of the Board of Education to " investigate the present sources of supply and the methods of recruitment and training of teachers and youth leaders, and to report what principles should guide the Board in these matters in the future."

As we briefly reported in our last issue, Siemens Brothers & Co., Ltd., have appointed **Mr. G. W. Giffin** as works manager in which position he will be responsible for all production and service departments throughout the whole of their Woolwich works and also their dispersal factories. Mr. Giffin had been connected with the cable industry for many years prior to his joining Siemens. He rose rapidly to the position of cable works manager at their Woolwich works and now at the early age of forty-five has taken over the further extended duties indicated.



Mr. G. W. Giffin

Sir Edward Wilshaw, K.C.M.G., the chairman and managing director of Cable & Wireless, Ltd., the operating company, has relinquished all the joint appointments held by him in the Cable & Wireless (Holding) group of companies, including that of joint managing director of Cable & Wireless (Holding), Ltd. He remains on the boards of all the companies of which he has relinquished the joint managing directorships and continues to be chairman and sole managing director of the operating company and chairman of five other companies in the group.

It is further announced that **Lord Pender** has resigned his position as joint managing director of the subsidiary operating companies of Cable & Wireless, Ltd., of which Sir Edward Wilshaw is chairman. These are the Cuba Submarine Telegraph Co., the Halifax and Bermudas Cable Co., the Direct West India Cable Co., Cable & Wireless (West Indies) and the Eastern Telegraph Co. (France). The *Financial Times* states that four directors of the Marconi International Marine Communication Co., Ltd., have resigned from the board. The effect of the resignations is that the remaining directors are directors also of the associated undertakings. Those who resigned were directors of Marconi International Marine alone.

A viscounty has been conferred upon the **Rt. Hon. David Margesson,** lately Secretary of State for War, who was recently appointed a director of the General Electric Co., Ltd. **Lt.-Col. J. T. C. Moore-Brabazon,** who until recently was Minister of Aircraft Production and is now a director of Electric & Musical Industries, Ltd., becomes a baron.

Dr. C. C. Paterson, O.B.E., M.I.E.E., director of the research laboratories at Wembley of the General Electric Co., Ltd,. has been elected a fellow of the Royal Society.

It was reported at a recent meeting of the Chester Corporation Electricity Committee that the period for which the services of **Mr. S. E. Britton** were retained would expire on April 11th. The Committee recommended that Mr. Britton's engagement be extended for one year.

Mr. L. D. Bennett has been appointed a director of Telephone Properties, Ltd.

The following appointments have been made by the Accrington Corporation Electricity Committee:—**Mr. J. R. Hall** to be deputy engineer and mains superintendent at a salary

of £656 rising to £680 in four years; **Mr. R. G. Hanna** to be station superintendent at a salary of £538 for a probationary period of three months, afterwards commencing at £555 and rising to £582 in four years; and **Mr. J. McKinstry** to be charge engineer at a salary of £355 for a probationary period of three months, afterwards commencing at £366, rising to £382 in four years.

Lowestoft Corporation has extended the service of **Mr. H. H. Saunders,** electricity and transport manager, for one year.

Dr. F. C. Stephan, who has been with the Telegraph Condenser Co. for many years (lately as director and joint general manager), has now joined the board of the Wego Condenser Co., Ltd. He will be responsible for research and the future developments of the latter company.

In connection with the office reorganisation to be carried out consequent upon the retirement of the chief clerk in the Hammersmith Electricity Department, the Executive Committee of the Borough Council recommends the promotion from Grade A to Grade B of **Mr. D. Butler** and **Mr. J. Fowler,** who are at present serving with the Forces. The Council has not hitherto agreed to the promotion of any permanent member of the staff serving in the Forces.

Obituary

Monsieur G. Vincent.—The death recently occurred in Brussels at the age of 56 years of M. Gerard Vincent, a director of the Société Internationale de Télégraphie sans Fil.

Capt. G. J. Scott.—We regret to report the sudden death last Sunday of Capt. Gilbert James Scott, M.I.E.E., chairman and managing director of Laurence, Scott & Electromotors, Ltd., at the age of 52. He was the son of the late Mr. W. H. Scott who, in 1883, founded the original company of Laurence, Scott & Co., Ltd. He became director of the company in 1922, managing director in 1936, and in 1938 succeeded his father as chairman. Between 1914 and 1918 he served in the R.F.C.; he was awarded the D.F.C. in 1918 and was subsequently wounded. Capt. Scott was born in Norwich, and educated at Willaston School, Cheshire, and at London University, where he took an honours degree in electrical engineering, subsequently gaining manufacturing experience abroad.

The late Capt. G. J. Scott

During his directorship he initiated much of the development in AC design and the extensive programme of expansion and modernisation of the firm's manufacturing resources at the various works which have been carried out during the past ten years. He was one of the original members of the works Home Guard platoon. Capt. Scott is survived by a widow, three daughters and two sons.

Views on Rationing

Questions in Parliament

IN the House of Commons on March 24th Sir Leonard Lyle asked the President of the Board of Trade whether, in connection with the proposed rationing of electricity and gas, he had given consideration to the fact that certain utility companies were urging that the obligation to consume approximately two units of electricity a week did not impinge upon the Government's plea for economy in this respect; and what action he proposed to take to correct this.

Mr. Dalton said he assumed that the hon. member was referring to the minimum quarterly charge which electricity undertakers were authorised to require from their consumers. Such a charge seemed reasonable in view of the service which was provided in return for it The point, however, would be considered in connection with the rationing proposals. If any company was suggesting to its consumers that they need not reduce their consumption, he would be glad to have particulars.

On March 25th Mr. Crowder asked the President of the Board of Trade whether he would give an undertaking that consumers of gas and electricity who economised forthwith in their consumption of fuel would not be penalised under the proposed rationing scheme by finding that their allotted quota was based on their reduced consumption during the present months; and whether he was aware that in view of the proposed scheme for rationing electricity and gas, many persons were now using as much as possible in order to qualify for the maximum ration; and whether he would make some announcement to discourage this unnecessary waste.

Captain Waterhouse, who replied, said that the President would do his best to ensure that consumers who economised forthwith in the use of gas and electricity would not be penalised in the rationing scheme on that account. Mr. Crowder might rest assured that, if there were unpatriotic consumers who were wasting gas and electricity in the hope of qualifying for a larger ration, they would not benefit thereby.

During the past week Sir William Beveridge and Sir Stephen Tallents, who have been asked by the President of the Board of Trade to report on the question of rationing coal, gas and electricity, have been consulting representative organisations and obtaining their views. The principal body concerned has been the Joint Gas and Electricity Committee whose formation was the outcome of the original (1939) rationing proposals. On Monday last week the Committee discussed with the two investigators the main problems that would be involved in a fuel rationing scheme. The proceedings, we are told, were "preliminary and private" and the Committee appointed a sub-committee to continue the discussions thus begun.

The views of a number of women's organisations, including the Electrical Association for Women, have also been put forward.

COMMERCE and INDUSTRY

Control of Employment. Mechanics in the Services.

Absenteeism in Industry

A NEW Order which came into force yesterday (Thursday) introduces new measures to deal with absenteeism and persistent lateness in factories covered by the Essential Work (General Provisions) Order. Where there is a works committee or joint council which can appropriately deal with such cases it will interview an alleged defaulter and give him four days in which to make representations. If it is considered that proceedings should be taken against him the National Service Officer is to be notified to this effect.

It is required of those responsible for essential undertakings that they keep records of absentees which shall be open to the inspection of trade union officials.

Engagement of Women

Restrictions placed upon the engagement of women over the age of thirty direct by employers in the building, civil engineering contracting, electrical installation and general engineering industries are removed by a new direction made by the Minister of Labour under the Restriction on Engagement Order. This is stated to be due to the fact that a high proportion of women over thirty are married and have household duties which restricts them to local employment. It is considered that employers can do a great deal to stimulate recruiting for part-time employment women who are not subject to direction.

Skilled Men in the Forces

As readers will have learned from the abstract in the ELECTRICAL REVIEW of February 27th of the second report of the Committee on Skilled Men in the Services, a number of employers and trade unions in the engineering industry were invited to provide the Committee with lists of skilled men who had joined the forces. The Committee then proceeded to ascertain how these men were being employed and its second report sets out the results of these investigations.

The invitation to employers was addressed in the first instance only to members of the Engineering and Allied Employers' National Federation but it is likely that numbers of men with engineering skill formerly employed in industries other than engineering, on maintenance and similar work, are now in the forces and should be brought under review. Accordingly the Committee is now prepared to receive particulars of such men of the following occupations from their former employers:—Blacksmith, boilermaker, coppersmith, electrician, fitter, metal-machinist setter-operator, millwright, moulder, pattern maker, plater, scientific instrument maker, sheet metal worker, shipwright, toolmaker, toolsetter, turner and draughtsman (shipbuilding and engineering).

Particulars should be sent to the Secretary, Committee on Skilled Men in the Services, Queen Anne's Chambers, Westminster, S.W.1, and should include the man's Service number, his rank, full name, Service unit or corps in which he is serving and his normal civilian occupation. It is emphasised that it is not the Committee's intention to obtain the release of men from the Services, but to ensure that tradesmen who are necessary for the maintenance and repair of fighting equipment in action are adequately used in their trade capacity. Every skilled engineer who can be found in the services not adequately employed at his trade and available for transfer will save unnecessary withdrawal from industry of other skilled men.

Power Station Engineers' Holidays

The decision of the Court of Arbitrators regarding a claim put forward by the employers' side for the amendment of the holiday clauses of the Schedule on account of the present national circumstances is announced by the Electrical Power Engineers' Association. The Court has decided that Clause 10 shall be amended so as to read: "An employee who on April 1st, 1942, has been in the continuous service of an undertaking for six calendar months immediately preceding such date shall be entitled to seven consecutive days holiday to be taken between April 1st and October 31st, 1942." No change is to be made in the provision of Clauses 11 and 12 except that the additional holidays provided for in Clause 11 need not be consecutive with the holiday provided for in Clause 10. The foregoing award is applicable only to the year 1942.

Double Summer Time

Clocks must be put forward an hour during the night of April 4th–5th when double summer time comes into force. This year the black-out period will remain from half-an-hour after sunset to half-an-hour before sunrise until May 3rd when these margins will be increased to three-quarters of an hour (one hour in Scotland, Northumberland, Durham and Cumberland). Last year the alteration of the black-out period took place with the change to double summer time which was instituted a month later than this year.

The "Osram" blackout chart shown in our advertisement pages was prepared some time in advance of our press date and is not correct under the present regulations. Readers should note that blackout times are 15 minutes earlier and "unblackout" times 15 minutes later than the times shown in the chart.

J.E.A. and Redundant Employees

As war conditions have severely restricted certain branches of the development work of the London and Home Counties Joint Electricity Authority it has been necessary to terminate contracts of employment, regard being paid to length of service in doing this. The approval of the local National Service Officer is necessary in such cases as the undertaking comes within the scope of the Essential Work (General Provisions) Order, 1942. In some cases after this official's permission has been received appeals have been lodged by the employees concerned and the

permission has been cancelled, without the reasons being given.

In these circumstances the Authority is compelled to retain these redundant men although there is no work for them. As this does not seem to be the intention of those responsible for the administration of the Order the Authority's General Purposes Committee has taken the matter up with the Ministry of Labour and National Service and suggests that such questions could be more efficiently and appropriately dealt with by the Electricity Commissioners.

Bathroom Fatality

At an inquest at Bristol last week on Mrs. Lillian Langley, who was found dead in the bath at her home, medical evidence showed that she died from electric shock; there were two burns on her left shoulder blade and another on her thumb. Questions were asked about an electric geyser in the bathroom of which it was stated that the earth wire was not connected up, the neutral wire had not been connected to its terminal and one of the heating elements was open-circuited.

Replying to these, Mr. J. C. Sanders, works manager and technical engineer of Santon, Ltd., the makers, stated that while these things were true of this particular geyser, which he had examined, and it was possible to get a shock by touching the spout of the geyser and one of the bath taps, the maximum current that would flow through the body was 2.5 mA, not sufficient to cause death. His company had made more than 10,000 similar heaters, which were all-insulated and provided with the necessary earthing and neutral connections which should be connected up by those who installed the geyser.

Mr. S. Ford stated that he had examined the geyser and felt a slight shock when touching the spout and tap. The earth wire was connected at the back of the geyser but the other end was unconnected. There were marks on the pipes that might have been caused by the earth wire having been originally connected. (On this point it was stated that a plumber had been working on the pipes to repair a leak.) He did not think the geyser was the cause of death at all; he thought it was due to cables that ran through tubing up the bathroom wall.

A verdict of "Accidental death" was returned.

Electrical Installation Dispute Settled

In the King's Bench Division on March 26th, Mr. Justice Wrottesley concluded the hearing of an action by G. A. Davenport, Ltd., Pinner, against Duncan Watson (Electrical Engineers), Ltd., claiming damages for breach of contract in connection with the installation of electric lighting and power at a temporary Government office in the north country.

The contract was said to have been made in January, 1940, whereby the plaintiffs arranged with the representative of the defendants, to make a tender for this electrical work. Mr. Davenport and Mr. Cull, who represented the defendants, met and it was agreed, according to the plaintiffs, that plaintiffs should furnish the defendants with a tender for the work, containing the prices at which the plaintiffs would be prepared to carry out the work. The tender was made and it amounted to £4,466.

It was further agreed, it was alleged, that the plaintiffs would pay the defendants £150 in respect of the contract. Forms were furnished to the plaintiffs, and they duly completed them. The plaintiffs alleged that in breach of the contract the defendants duly obtained the contract and carried out the work themselves. Plaintiffs had always been ready and willing to carry out the contract and in the circumstances they claimed damages.

The defendants, denied the agreement set up by the plaintiffs, or that Mr. Cull had authority to do so. They pleaded that to enter into such an agreement would be against public policy, and that the Government did not allow subcontracting. Plaintiffs, in their reply, said it was understood that the defendants would obtain the permission of the proper authority for the plaintiffs to carry out the work.

After several days' hearing, it was announced that the parties had arrived at a settlement of the action. Mr. Stenham said the parties had agreed to terms and he asked for judgment for the plaintiffs for £150 and costs to be agreed or taxed.

Mr. Fortune agreed with the terms and judgment was entered accordingly for the plaintiffs.

Paper Salvage

It is announced that Mr. G. B. Hutchings, the Director of Salvage and Recovery of the Ministry of Supply, has joined the board of the Waste Paper Recovery Association. This non-profit making Association was formed for the purpose of stimulating the salvage of waste paper, cardboard, etc., and economy in its use. The directors are representatives of newspapers, periodicals, board mills and paper mills.

The appointment of Mr. Hutchings is for the purpose of ensuring the closest possible liaison between the Association and the Salvage Department of the Ministry, and is made with the approval of Sir Andrew Duncan, Minister of Supply.

It is hoped that this appointment will draw attention to the increasing need for all the waste paper that can be gathered. Collection must be regularly organised and not regarded as a "special effort."

Cable Makers' Wages

The N.J.I.C. for the Electric Cable Making Industry announces that there will be no alteration in wages in the industry on the third pay-day in April.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following—

BENZON chair for vibrating exercises.

RIPOLITE illuminating glassware.

Factory-Plant Breakdowns

Extracts from an Inspector's Case Book

By S. Lees

ELECTRICAL maintenance staffs are being hard pressed to keep machinery running satisfactorily under war conditions, since the insistent call for even greater production brooks no stoppages. Many installations dating back two, three and even four decades are still operating on original layouts, and are expected to cope with present-day abnormal requirements, for which they are inherently unsuitable. Overloading, conversion for speed variation, unsuitable drives, new transmissions, and adverse atmospheric and other external conditions are already taking toll of elderly motors, which have never really recovered from the severe handling they received twenty-odd years ago.

In many installations cables and wiring are feeling the effects of insidious overloading and have fired due to overheating. Old DC wiring has been pressed into multi-phase service with the necessary cable addition in order to obviate an indefinite delay while waiting for the delivery of new material. Few opportunities occur for shutting down plant items for overhaul or even cleaning. A few typical breakdowns that have come to my notice are dealt with below.

Examples of stoppages quoted by the author stress the need for frequent inspection and skilled maintenance to prevent interference with production

A 300-HP motor which had undergone a somewhat hurried overhaul and repair broke down within a few days of its reinstatement. Examination showed that the commutator end-bearing had been located out of proper position, and the inner nose of the bearing bush had fouled the oil-thrower rings, completely grinding off one ring and partially cutting the other. The resultant excessive axial end-play of the shaft caused the armature to foul the brush-gear, tearing the brush-holders and stripping the commutator risers. This entailed a total rewind of armature and new brush-gear.

Defective Lubrication

Another DC motor was provided with a combined oil-gauge and drain-cock to bearings. The drain-cock was accidently broken, and a temporary wood plug was fitted in its place until the motor could be shut down for fitting a new drain-cock. In the meantime the wood plug came adrift unnoticed and the oil-well ran dry. In consequence the bearing overheated and stripped and the armature fouled the field pole-shoes, causing complete breakdown of armature and field-coils and necessitating a total rewind.

An AC motor driving key plant came to a sudden stop through the failure of its driving belt, but not before the stator winding had gone up in smoke. The bearings were worn, but the tension of the driving belt had pulled the rotor more or less concentric when running. On removal of the belt pull the rotor fouled the stator. Timely checking of the air-gap by feeler-gauge, or even trying the "lift" of the driving shaft, would probably have averted this breakdown.

A rush lunch-hour inspection of a turbo-alternator was followed by a temporary stoppage of supply which might have turned out more serious. The usual procedure was adhered to, *i.e.*, no connections were uncoupled, and the only circuit-breaker opened was that controlling the alternator. All insulation-resistance tests were made by tapping at convenient bare points, to guard against unforeseen eventualities and owing to the limited time available. Everything seemed satisfactory so the main circuit-breaker was closed and the turbo-alternator was run up to speed. Excitation was prompt and busbar volts steady, but on switching on the works motors nothing happened. Eventually the trouble was traced to the alternator circuit-breaker, one of the phase bars having lost its contact members, which were found lying at the bottom of the oil-tank. The primary cause of the failure was a missing lock-pin which had allowed the contact-bar nuts to work loose gradually. At the time of opening the circuit-breaker the nuts were apparently holding on by less than a turn. Obviously more frequent internal examination would have prevented this stoppage.

A Broken Shaft

A three-bearing DC motor developed a slight clicking noise, intermittent and at irregular periods, no other symptoms being observed. A thorough examination failing to reveal the cause, the motor was sent to the maker's works and set up in a hydraulic press. After pressing, the driving-end of the shaft fell off revealing a claw-like break of clean fracture, situated about 6 in. down the bore of the armature sleeve. The slight clicking noise came from the back-lash set up between the broken ends. Had this motor been of the plain two-bearing type the diagnosis of the trouble would have been simplified.

For over six years an installation of AC motors with grease-lubricated ball bearings, but not fitted with external grease cups or

nipples, ran on the original makers' works filling of grease. When the bearing housings were opened sufficiently for an inspection the grease was found in good condition being only slightly discoloured and both evaporation and leakage were negligible.

Experience of a large AC motor with wound rotor, fitted with grease-lubricated roller ball bearings was different. The bearings started to chatter and the balls were found to have facets ground on the surface. Although the housings were not short of grease the bulk adhered to the walls, the races being more or less dry. Grease "creepage" had previously been observed and new bearings were fitted, but soon after the same condition developed. The end-shield housings were altered and a modified bearing-well of reduced grease capacity was substituted. This proved completely successful. Whirling, liquefaction, and "creepage" (not race creep) of grease were thus eliminated, and it would seem that these factors had been, if not the primary, then largely the contributory cause of the bearing trouble.

Many makers still use external screw-cap lubricators, some fit nipples for gun charging, others make no provision at all except by opening the housing cover. Of recent years a few makers have adopted a type of screw-down cup lubricator attached by a longish pipe line. Such pipe lines call for watching as under cold conditions grease tends to harden and choke the pipe bore, usually at a bend or connection, while in hot atmospheres the grease may liquefy and flood or leak; also the pipes should be protected against accidental damage. My own preference is for a correctly designed ball roller housing of the sealed type.

Forthcoming Events

Institution of Electrical Engineers.—Wednesday, April 15th, 2.30 p.m. Joint meeting at the Institution of Civil Engineers (see note, page 346).—Monday, April 20th, 6 p.m. Informal discussion on "The Applications of Electricity in Hospitals," to be opened by Mr. C. Morgan Davies.—Thursday, April 23rd, 6 p.m. Kelvin Lecture: "The Future of Transoceanic Telephony," by Dr. O. E. Buckley.

Meter and Instrument Section.—Friday, April 10th, 6 p.m. Informal discussion on "The Post-war Integrating Meter," to be opened by Mr. E. Fawssett.

Wireless Section.—Tuesday, April 14th, 6 p.m. Informal discussion on "Distortionless Detection," to be opened by Mr. A. J. Heins Van Der Ven.

Transmission Section. — Wednesday, April 15th, 6 p.m. "A High-voltage High-rupturing-capacity fuse and its effect on Protection Technique," by Mr. K. Dannenberg and Prof. W. J. John, B.Sc.(Eng.).

Installations Section.—Thursday, April 16th, 6 p.m. "Fluorescent Lamps," by Messrs. L. J. Davies, M.A., B.Sc., H. R. Ruff, B.Sc., and W. J. Scott, B.Sc.

North Midland Centre.—Saturday, April 11th, 2.30 p.m. Guildford Hotel, The Headrow, Leeds. Annual meeting and lecture by Mr. A. V. Williamson, M.A.—*Students' Section.*—Saturday, April 11th, 2.30 p.m. Hotel Metropole, Leeds. Film afternoon.—Saturday, April 25th. "Switchgear," by Mr. A. R. Rumfitt.

North-Eastern Centre.—Monday, April 13th, 6.15 p.m. Neville Hall, Westgate Road, Newcastle. Annual meeting, 7 p.m. Royal Station Hotel. Informal conversazione with reception by the President (Sir Noel Ashbridge). Tickets 2s. 6d. each from Mr. J. McGeary (A. Reyrolle & Co.).—*Students' Section.*—Friday, April 17th, 6.30 p.m. Annual meeting and film night.

Western Centre. — Monday, April 13th. Bristol. Discussion on Post-war Planning.

North-Western Centre.—Saturday, April 18th, 2.30 p.m. Engineers' Club, Albert Square, Manchester. Annual meeting and paper on "The Management of Protective Gear on Power Supply Systems," by Messrs. W. Casson and F. H. Birch, B.Sc.—*Students' Section.*—Saturday, April 11th. Annual meeting and "Low-head Hydro-electric Schemes," by Messrs. J. B. Higham and B. V. Poulston.

South Midland Centre.—Monday, April 20th. Birmingham. "A Critical Review of Education and Training for Engineers," presented by Dr. A. P. M. Fleming, C.B.E., M.Sc., for the Education, Training and Personnel Sub-Committee of the Post-war Planning Committee.—*Students' Section.*—Thursday, April 9th, 7 p.m. Association Hall, English Electric Co., Stafford. "The Testing of Electrical Steel Alloy Sheet," by Mr. K. R. Matthews.

Mersey and North Wales (Liverpool) Centre.—Monday, April 20th, 6 p.m. Liverpool Royal Institution, Colquitt Street. Annual meeting and short papers.

London Students' Section.—Wednesday, April 22nd, 7 p.m. Annual meeting.

Devon and Cornwall Sub-Centre.—Thursday, April 23rd, 5.30 p.m. (tea 5 p.m.). Continental Hotel, Millbay Road, Plymouth. "Public Address Systems," by Mr. S. Hill.

Institution of Rubber Industry.—Monday, April 13th. London Section annual meeting and paper on "Engineering Problems of the Rubber Industry," by Mr. C. D. Lightfoot.

Illuminating Engineering Society.—Tuesday April 14th, 5 p.m. Lighting Service Bureau, 2, Savoy Hill, W.C.2. "Fluorescent Light Sources," by Mr. J. N. Aldington. I.E.E. members are invited.

Midland Regional Centre.—Friday, April 17th, 6 p.m. Imperial Hotel, Birmingham. Annual meeting, followed at 6.30 by a talk on "The Eye," by Dr. J. R. Mitchell, school medical officer for Birmingham.

Electrodepositors' Technical Society.—Tuesday, April 7th, 6 p.m. James Watt Memorial Institute, Birmingham. "Solvent Economy in Trichlorethylene in Degreasing Plants," by Mr. W. F. Jesson.—Monday, April 13th, 5.30 p.m. Northampton Polytechnic, London, E.C.1. "Experiences in Alkaline Zinc Plating," by Messrs. J. S. Jones and P. M. Walker.

ELECTRICITY SUPPLY

Minimum Charge Justified. *Lighting Contract Appeal*

Accrington.—RATE RELIEF POLICY.—Referring to a suggestion that the Electricity Commissioners "did not favour the policy of handing over electricity profits for the relief of rates" at a meeting of the Town Council on March 24th. Councillor Slack said he did not care whether the Commissioners favoured it or not. He contended that a reasonable balance from a great trading undertaking behind which the Corporation had stood in bad times and good could be reasonably expected, providing it was done in such a way as not to make the cost of the commodity higher. It could be justified, whether the Commissioners liked it or not, and he looked forward to a continuance of rate help from the Electricity Department. Sir Thomas Higham, chairman of the Electricity Committee, pointed out that the Committee undertook to finance side-street lighting at a cost of £10,000 and also undertook to find the money free of interest until it was repaid at the rate of £1,000 a year.

Barnes.—FURTHER CONCESSIONS.—For the December quarter the Council approved rebates to electricity consumers which reduced the unit charges by 10 per cent., after suspending the 20 per cent. addition applied in March last year. The good response of consumers to the Council's appeal that consumption should be cut down at the peak period has now made possible further concessions, and for the March quarter the 20 per cent. addition is again being suspended and there is a 16 per cent. reduction in unit charges. In the case of the domestic two-part tariff the fixed charge is not to be paid for the March quarter, and this will have the effect of making the fixed charge payable at the end of the quarter instead of in advance. The rebates will benefit consumers by £10,000, making £17,000 for the two quarters.

Dover.—MINIMUM CHARGE.—Reference was made to the justification of a minimum charge in a report by Mr. W. J. Broad (secretary) to the Electricity Committee last week. It was decided, in 1937, to impose a minimum charge of 7s. for each winter quarter and 3s. 6d. for each summer quarter, he said. There had been comparatively little criticism. Most of the complaints were from consumers who had temporarily left their homes owing to war conditions and who would not agree to have the supply disconnected so as to avoid the minimum charge. They wished to make occasional visits to their homes and have the supply available at such times for lighting and heating. The Electricity Department had to hold itself in readiness to meet the demand and this valuable service was, he thought, worth the small minimum charge. The borough electrical engineer (Mr. R. G. Widgery) pointed out that these people who were evacuated and came back for a week or so might switch on their heaters during the peak load period and increase the undertaking's costs by £7, which could not be got back from the consumer.

East Midlands.—DISSOLUTION OF BOARD.—The East Midlands Electricity District (Amendment) Order, 1942, disestablishing the East Midlands Electricity Advisory Board has now been confirmed by the Board of Trade and approved by both Houses of Parliament.

Egham.—STREET-LIGHTING CONTRACT.—As reported in our issue of March 6th, Mr. Justice Cassels gave judgment on February 25th in favour of the Egham & Staines Electricity Co., Ltd., in its claim to recover the sum of £3,590 in respect of a street-lighting contract with the Egham Urban District Council. At last week's meeting the Council decided to appeal against the judgment. At the same time negotiations are to be carried on with the company in the hope of reaching a settlement satisfactory to both parties.

During the discussion of the matter it was stated that the Council had asked the company to provide a statement showing the division of its charges as between capital, maintenance and the supply of energy but the company had consistently declined to supply the information.

Epsom and Ewell.—LOWER CHARGES.—The wartime addition to electricity charges is to be again reduced. Originally the increase was 25 per cent., this being subsequently reduced to 16⅔ per cent., and at its last meeting the Borough Council approved a further reduction to 10 per cent. Alderman Cushine stated that the electricity undertaking had shown a marked improvement in its financial position and for the first time in his recollection had produced a substantial profit.

London.—J.E.A.'s BORROWING POWERS.—This week the London and Home Counties J.E.A. gave notice of its intention to apply to the Electricity Commissioners for a Provisional Order to increase its borrowing powers. Objections must be sent by registered post to the Secretary, Electricity Commission, Savoy Court, Strand, W.C.2, by May 1st, copies being sent at the same time to the Clerk and Solicitor to the Authority, 5-6, Lancaster Place, Strand, W.C.2.

Morecambe.—COMMISSIONERS' VIEWS ON CHARGES.—The Electricity Commissioners have informed the Council that in their opinion, from the standpoint of the general financial position of the electricity undertaking, there is no justification for an increase of charges to consumers. They recognise that the proposed increase in the "unit" rate may not be unreasonable, provided the Council is prepared to make a reduction of 20 per cent. in the fixed charge, or to allow an overall discount of 10 per cent. on Scale C tariff as a whole. After considering this communication the Electricity Committee appointed a deputation to interview the Commissioners as soon as possible.

Perthshire.—STREET LIGHTING CHARGES.—With regard to the note in our March 20th issue, the Grampian Electricity Supply Co. informs us that a restricted payment of one-third only (not 44⅓ per cent. as stated) of the charges exigible, but subject to such kWh charges as may be payable in respect of any special wartime street lighting, is being accepted by the company from the local authorities concerned, throughout the whole of its areas of supply, in respect of the lighting season 1941-42.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The County of London Electric Supply Co., Ltd., held its annual meeting on March 24th, when Sir Robert Renwick, Bt. (chairman), who presided, said that the business of the company had made satisfactory progress. In 1940 there had been a slight falling off as compared with 1939, but last year the position had corrected itself, and this was reflected in a small increase in the working profit in spite of severe increases in expenditure. Their subsidiary and associated companies, with the exception of three of the smaller companies, continued to show similar satisfactory results.

While they maintained supplies to their ordinary consumers, practically the whole effort of the company nowadays was devoted to the national and essential services. It was not always, however, that they felt satisfied that things were moving fast enough or that they could obtain acceptance of some of their ideas. As an instance, they proposed during the past year that nine of their subsidiary companies should be amalgamated and they were able to advance a strong case for the benefit of consumers and for the cutting of expenditure. The proposal was met with opposition on the grounds that they might be putting themselves in a stronger position for the period after the war.

At a number of conferences with some of their peacetime competitors in the gas industry they had examined, as a measure of wartime co-operation, certain possibilities where their functions were common, with a view to economy in man-power and expenditure.

The Metropolitan Electric Supply Co., Ltd.—Presiding at the annual meeting held on March 24th, Major H. Richardson (chairman and managing director) said that their plant had been maintained in good order, all demands on the company and its subsidiary companies had been satisfactorily met and supply had been fully maintained during the year. While keeping clearly before them the primary necessity of contributing every effort towards winning the war they were not unmindful of the desirability of keeping well in touch with responsible post-war schemes of reconstruction and they fully appreciated the important part which electricity undertakings should take in all such future planning. It was still necessary that the general public should be informed of the particularly valuable work which the company-controlled undertakings had done in making electricity available in thousands of square miles of sparsely populated and rural areas.

The Automatic Telephone & Electric Co., Ltd., held its annual meeting on April 1st when Sir Alexander Roger (chairman) presided. In a statement which was circulated with the directors' report and accounts the chairman said that the past year had seen increases in costs, and while price control was operating in the case of materials to a large extent, we were still without a fixed policy which would arrest the cost of living and consequently the level of wages. If these factors were allowed to proceed unchecked, inflation and slackening of effort became dangerous possibilities. Sir Alexander emphasises the vital need for more and more production. Their own concern, against strong world competition, had multiplied its output six times in the last twenty years.

The trading profit, dividends, etc., for 1941 (after providing for tax and contingency reserve adjustment) amounted to £261,548, as compared with £238,052 for 1940. Depreciation requires £50,163, directors' fees £3,052, war damage premiums £24,997 and contingency and tax reserve £60,000. As already announced, the final ordinary dividend is 7 per cent. plus a bonus of 2½ per cent., making the total distribution for the year 12½ per cent. (same), and a similar distribution is made on the deferred. The balance carried forward is £146,211 (against £167,422 brought in).

The London Passenger Transport Board is to replace its issue of £12,583,000 4½ per cent. T.F.A. stock with a security bearing a lower rate of interest. The Treasury has agreed to the replacement of the stock by another which will have the same ranking as the existing issue with a similar guarantee as to principal and interest by the Government. Approval has been granted subject to the necessary Parliamentary powers being obtained. The Board is taking steps to promote a Bill in the present session of Parliament to authorise it to create an issue of new stock, which will be issued, and redemption and conversion of the existing stock effected, on January 1st, 1943.

International Combustion, Ltd.—In the course of his statement presented at the annual meeting on March 25th, the chairman (Mr. G. R. T. Taylor) said that although the output during the past year compared favourably with the previous highest the percentage profit on turnover had been considerably reduced. This was accounted for by certain contracts upon which they did not expect to make the normal rate of profit. He commended the company's employees for the way in which they had kept output flowing in these difficult times.

Lancashire Dynamo & Crypto, Ltd., announces a profit for 1941, after providing for depreciation, tax, E.P.T., etc., of £111,015, as compared with £105,035 for the previous year. The ordinary dividend for the year is 15 per cent., plus a bonus of 5 per cent. (unchanged), the staff fund receives £2,500 and £143,883 is carried forward (against £118,669 brought in).

London Associated Electricity Undertakings, Ltd., reports a net profit for 1941 of £264,998, as compared with £304,794 for 1940. The ordinary dividend for the year is 4 per cent. (against 4½ per cent.) and the balance carried forward is £3,237 (against £7, after crediting £25,000 transferred from stockholders' reserve).

The Montreal Light, Heat and Power Consolidated report gross revenues for 1941 of $30,033,079, as compared with $27,084,867 for 1940, and a net income of $8,451,631 (against $7,947,034). Dividends absorb $6,733,549,

pensions $20,000, extra depreciation $750,000, insurance and contingency reserve $500,000, and the balance carried to surplus is $448,081 ($443,439).

Pye (Ireland), Ltd., report a net profit, after tax, for 1941 of £3,226 (against £2,627 for 1940). The dividend for the year is maintained at 7½ per cent. and £2,973 is carried forward (against £1,820 brought in).

The British Engine Boiler & Electrical Insurance Co., Ltd., announces a profit for the past year of £93,414 (against £99,215). A dividend of 34 per cent. is again paid, and £105,435 is carried forward (against £73,478 brought in).

The Shropshire, Worcestershire & Staffordshire Electric Power Co. announces final dividends of 4 per cent. on the "A" and 3 per cent. on the "B" ordinary shares, again making 8 and 5½ per cent., respectively, for the year.

The Salisbury Electric Light & Supply Co., Ltd., has announced a final dividend of 6 per cent., making 10 per cent. for the year (unchanged).

The South Wales Electric Power Co.'s final dividend is 3½ per cent., making the total 5½ per cent., the same as last year.

The Urban Electric Supply Co., Ltd., is paying a final dividend of 4 per cent., making 8 per cent. (same) for the year.

The Woking Electric Supply Co., Ltd., announces a final dividend, tax free, of 4½ per cent., again making 7½ per cent. tax free for the year.

The British Oxygen Co., Ltd., is paying a final dividend of 7 per cent., making 14 per cent. for the year (against 15 per cent.).

The Globe Telegraph and Trust has declared a quarterly dividend of 1 per cent. net (against 1¼ per cent.).

Joseph Lucas, Ltd., are again paying an interim dividend of 2½ per cent.

The Anglo-American Telegraph Co. is again paying a quarterly dividend of ¾ per cent.

New Companies

G. S. Peckham & Co., Ltd.—Private company. Registered March 7th. Capital, £5,000. Objects: To carry on the business of electrical engineers, manufacturers of and dealers in insulated cables and wires, lamps, batteries, insulating materials, electrical accessories, motors, dynamos, heating and cooking appliances, fans, medical equipment, X-ray apparatus, artificial sunlight lamps, etc. Directors: E. A. V. Peckham and Hilda E. Peckham, both of Shirley, Copse Avenue, West Wickham, Kent. Secretary: D. R. Edey.

Priory Electric Service (Coventry), Ltd.—Private company. Registered March 12th. Capital, £2,000. Objects: To carry on the business of electrical and wireless engineers, service agents, lighting specialists, heating, refrigerating and ventilating engineers, etc. Directors: T. E. Morton, 35, Russell Terrace, Leamington Spa, and T. F. Hartley, 55, Watercall Avenue, Coventry. Registered office: 3, Lower Ford Street, Coventry.

Reels, Ltd.—Private company. Registered March 12th. Capital, £2,000. Objects: To carry on the business of manufacturers of and dealers in reels, bobbins, cable drums, beams, rollers and similar goods for the electrical cable and wire industries and other trades and purposes, etc. Directors: V. Bancroft, Bodhyfryd, Beardwood Drive, Blackburn and J. W. Bancroft, Netherleigh, Shear Bank Road, Blackburn. Registered office: Greenbank Works, Byron Street, Preston, Lancs.

Companies' Returns

Statements of Capital

Wycombe Electrical Supplies, Ltd.—Capital, £1,000 in 1,000 shares of £1 each. Return dated January 5th, 1942. All shares taken up. £2 paid. £998 considered as paid. Mortgages and charges: £600.

Associated Manufacturers of Electric Traction Equipment, Ltd.—Capital, £10,000 in £1 shares. Return dated July 31st (filed September 12th). All shares taken up. £2,500 (5s. per share) paid. Mortgages and charges: Nil.

Stella Conduit Co., Ltd.—Capital, £20,000 in 20,000 shares of £1 each. Return dated November 3rd. All shares taken up. £20,000 considered as paid. Mortgages and charges: Nil.

Electric Driers, Ltd.—Capital, £2,000 in 2,000 shares of £1 each. Return dated November 13th. All shares taken up. £1,950 paid. £50 considered as paid. Mortgages and charges: Nil.

G. H. Gould, Ltd.—Capital, £3,000 in 12,000 shares of 5s. each. Return dated December 5th, 1940 (filed November 5th, 1941). 10,000 shares taken up. £2,500 paid. Mortgages and charges: Nil.

Mortgages and Charges

Underwood (Electric), Ltd.—Assignment of contract moneys, dated March 5th, 1942, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £500.

Kingsland Engineering Co., Ltd.—Satisfaction in full on January 14th, 1942 of series of debentures for £400 authorised January 9th, 1930, and supplemental charge dated April 9th, 1934, and registered January 15th, 1930, and April 10th, 1934, respectively.

Bankruptcies

F. L. Hawdon (Locksley & Co.), electrical and radio engineer, 27A, Sale Street, London, W.2.—Last day for renewing proofs for dividend April 10th. Trustee, Mr. H. H. Gaine, Bankruptcy Buildings, Carey Street, London, W.C.2, Official Receiver.

F. Johnson, electrical engineer, 115, Ullswater Crescent, Kingston Vale, Surrey, lately trading at 36, St. Phillips Avenue, Worcester Park, and 36, Westwood Road, Barnes.—First meeting April 8th at 29, Russell Square, London, W.C.1. Public examination May 12th at the Guildhall, Kingston-on-Thames.

L. Dixon, journeyman electrician, 209, Hall Street, Stockport, formerly carrying on business at 165, Great Portwood Street, Stockport, as an electrician.—Last day for receiving proofs for dividend April 11th. Trustee, Mr. F. H. Langmaid, 20, Byrom Street, Manchester, 3, Senior Official Receiver.

STOCKS AND SHARES

TUESDAY EVENING.

CONCLUSION of London's Warship Week released Stock Exchange markets from the effect of this absorption of capital; Budget possibilities now loom largely in the immediate prospect. There is the usual amount of advance speculation as to what the Chancellor of the Exchequer will propose in order to balance his Budget and, also as usual, the effect is to add a fresh element of restraint to the other factors which, for the time being, place a check upon investment and speculative investment. The task of the Chancellor of the Exchequer is acknowledged to present difficulties which can only be resolved by heavier taxation; and, while the matter remains in suspense, it cannot be expected that notable activity will develop in stocks and shares. In the meantime, the prices keep so steady as to evoke surprise. During the Warship Week and before it, there was very little selling. People seemed to find new money without the necessity of realising their interests in stocks and shares.

London Transport Board

The new programme of the London Passenger Transport Board for the summer season, indicates the substantial savings which reduction of the services will ensure in the way of petrol, rubber, labour, etc. The "C" stock is up a point, at 40. Notice has been given by the Board of its intention to pay off £12½ millions of 4½ per cent. Trade Facilities Act stock, which the Combine has the right to repay in July. Reference was made to the likelihood of such redemption taking place, in the ELECTRICAL REVIEW of March 6th. This will bring more money into the Stock Exchange for employment. As has already been observed, other companies which have the right to repay obligations, and can replace these with another issue at a lower rate, are likely to take advantage of their option and to reduce the interest charge in a manner which the present cheap money policy of the Government not only permits, but encourages.

Cable and Wireless

Comment has been aroused by the notification that Sir Edward Wilshaw has relinquished the joint managing directorships which he held with Lord Pender in the Cable & Wireless (Holding) group of companies. Lord Pender has also resigned his joint managing directorship of Cable & Wireless subsidiary companies of which Sir Edward Wilshaw is chairman. The company has issued a statement dealing with the matter; a statement which, however, piques curiosity as to the reason for the resignations. A rise of 6 points has lifted the 5½ per cent. preference stock to 94½; the ordinary is up 1½, to 51½.

Metropolitan Electric Supply

At the meeting of the Metropolitan Electric Supply Co., the chairman claimed that it was still necessary for the general public to be informed of the particularly valuable work which the company-controlled electricity supply undertakings have done in the country. The availability of electricity supply in thousands of square miles of sparsely populated areas had been almost entirely due to the enterprise of the supply companies, which continued to make still greater efforts to take the supply of electricity further afield to the undoubted advantage of the country.

County of London Electric

Notwithstanding the prohibition, imposed by the Defence Regulations upon electricity supply companies, against giving details of operations during the past year, interesting sidelights serve to show the conditions of working, and the progress that the companies are making. The County of London Electric Supply Co. proposed to amalgamate nine of its subsidiary companies for the benefit, as the chairman said at the recent meeting, of consumers and for the cutting down of expenditure. The proposal was turned down "through what I am bound," he added, "to describe as that paralysis of thought which seems to beset so much of the national effort where it does not run along routine lines." Moreover, in order to save man-power and expenditure, the County of London Company proposed that the reading of the gas and electricity meters in private houses should be carried out by a common effort. The experiment was tried and it lasted for just one day. The trade unions declined to fall in with the suggestion, which has been now placed before the Minister of Labour and National Service.

Changes in Prices

The news from the Far East being read more favourably, has had the effect of bringing in buyers for some of the Indian shares that have fallen heavily of late. Calcutta Electrics are ⅛ up at 21s. 3d., and there has been an inquiry for Madras Electrics at 15s. 4d. Jerusalem Electric shares advanced to 19s.6d. The Home group shows comparatively few changes. The preferences are mainly better. Edmundsons sevens, for instance, at 34s. 6d. are 9d. higher. Two of the companies in which Edmundsons hold a controlling interest have declared similar dividends to those of a year ago. The South Wales Electric Power 3½ per cent. final dividend makes 5½ per cent. for 1941, and the Shropshire, Worcestershire and Staffordshire Electric Power Co. declares a final dividend of 4 per cent. on the ordinary, a repetition of 8 per cent. for the year. The "B" shares again receive 3 per cent. making 5½ per cent. for the twelve months.

(*Concluded on page* 449)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Mar. 31	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	15	12½	55/-	..	4 11 0
British Power and Light	6	6	27/6	..	4 7 3
City of London	7	7	27/6	..	5 1 9
Clyde Valley	8	8	39/6	..	4 1 0
County of London	8	8	37/6	..	4 5 6
Edmundson's:					
7% Pref.	7	7	34/6	+9d.	4 1 2
Ord.	6	6	28/6	..	4 4 3
Elec. Dis. Yorkshire	9	9	42/6	..	4 4 9
Elec. Fin. and Securities	12½	12½	46/3	..	5 8 2
Elec. Supply Corporation	11½	10	45/-	..	4 9 0
Isle of Thanet	2	Nil	10/-	..	—
Lancs. Light and Power	7½	7½	34/6	..	4 7 0
Llanelly Elec.	5½	5½	22/-	..	5 0 0
Lond. Assoc. Electric	4½	4	18/3xd	..	4 7 8
London Electric	6	6	25/9	..	5 13 3
London Power Red. Deb.	5	5	103½	..	4 16 7
Metropolitan E.S.	8	8	36/3	..	4 8 6
Midland Counties	8	8	38/9	..	4 2 0
Mid. Elec. Power	9	9	42/6	+⅛	4 4 4
Newcastle Elec.	7	7	27/6	..	5 1 10
North Eastern Elec. Ordinary	7	7	30/-	..	4 13 4
7% Pref.	7	7	34/-	+6d.	4 2 4
Northampton	10	10	46/3	..	4 6 7
Notting Hill 6% Pref. (£10)	6	6	8½	..	—
Northmet Power:					
Ordinary	7	7	35/9xd	..	3 18 4
6% Pref.	6	6	32/6	+6d.	3 13 10
Richmond Elec.	6	6	25/-	..	4 16 0
Scottish Power	8	8	38/3	..	4 3 9
Southern Areas	5	5	20/9	+3d.	4 16 7
South London	7	7	26/-	..	5 7 8
West Devon	5	5	21/3	..	4 14 1
West Glos.	4½	4½	21/3	..	4 4 8
Yorkshire Elec.	8	8	39/6	..	4 1 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/-	..	—
Calcutta Elec.	8*	7*	21/3	+⅛	—
Cawnpore Elec.	10	10	25/-	..	8 0 0
East African Power	7	7	27/-	..	5 3 8
Jerusalem Elec.	7	5	19/6	+9d.	5 2 8
Kalgoorlie (10/-)	7½	7½	9/6	..	7 12 10
Madras Elec.	6*	4*	15/-	..	5 6 8
Montreal Power	1½	1½	23½	..	6 7 8
Palestine Elec. "A"	Nil	Nil	18/9	..	—
Perak Hydro-elec.	6	7	5/-	..	—
Shawinigan Power	83cts.	90cts.	14½	..	—
Tokyo Elec. 6%	6	6	12½	..	—
Victoria Falls Power	15	15	72/6	..	4 2 9
Whitehall Inv. Pref.	7½	5	15/9	..	6 7 0

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Mar. 31	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1950-70	5	5	110	..	4 11 1
1955-75	5	5	113	..	4 8 6
1951-73	4½	4½	109	..	4 2 7
1963-93	3½	3½	103	..	3 8 0
1974-94	3½	3½	99	..	3 9 8
London Elec. Trans. Ltd.	2½	2½	94	..	2 13 2
London & Home Counties 1955-75	4½	4½	110	..	4 1 10
Lond. Pass. Trans.:					
A	4½	4½	121½	+1	3 14 1
B	5	5	119½	..	4 3 8
C	3	2⅞	40	+1	7 3 9
West Midlands J.E.A. 1948-68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo.-Am. Tel.:					
Pref.	6	6	109½xd	+¾	5 9 8
Def.	1½	1½	25	..	6 0 0
Anglo-Portuguese	8	8	15/-	..	10 13 4
Cable & Wireless:					
5½ Pref.	5½	5½	94½	+6	5 16 5
Ord.	4	4	51½	+1½	7 15 2
Canadian Marconi $1	Nil	4cts.	5/6	..	3 0 0
Globe Tel. & Tel.:					
Ord.	8½*	8½*	25/-	..	—
Pref.	6	6	25/-	..	4 16 0
Great Northern Tel.:					
(£10)	20	20	13	−½	—
Inter Tel. & Tel.	Nil	Nil	3	..	—
Marconi-Marine	7½	7½	28/9	..	5 4 4
Oriental Tel. Ord.	11½*	16	47/6	..	6 14 9
Telephone Props.	6	Nil	8/9	−⅛	—
Tele. Rentals (5/-)	10	10	9/-	..	5 11 1
Traction and Transport					
Anglo. Arg. Trans.:					
First Pref. (£5)	Nil	Nil	5/-	..	—
4% Inc.	Nil	Nil	9½	..	—
Brit. Elec. Traction:					
Def. Ord.	45	45	915	..	4 18 3
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8	10	45/-	..	4 9 0
Brazil Traction	$1	50c.	13½	..	—
Calcutta Trams	8	5½	12/6	..	8 16 0
Cape Elec. Trams.	5	5	19/-	..	5 5 3
Lancs Transport	10	10	45/-xd	+⅛	4 9 0
Mexican Light:					
1st Bonds	5	5	77½	+2	6 3 0
Rio 5% Bonds	5	5	97½	..	5 4 8
Southern Rly.:					
5% Prefd.	5	5	63½	..	7 17 6
5% Pref.	5	5	110½	+2	4 10 6
T. Tilling	10	10	48/9	..	4 2 2
Tilling & B.A.	7*	6½*	52/6	..	2 9 6
West Riding	10	10	39/-	..	5 2 7

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939-40	Dividend 1940-41	Middle Price Mar. 31	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord. ..	Nil	7½	24/–	..	6 5 0
Assoc. Elec.:					
Ord.	10	10	45/–	..	4 9 0
Pref.	8	8	38/9	..	4 2 4
Automatic Tel. & El.	12½	12½	46/3	..	5 8 3
Babcock & Wilcox	11	11	43/9	..	5 0 6
British Aluminium	10	10	43/3xd	..	4 12 4
British Insul. Ord.	20	20	93/9xd	+1/3	4 5 6
British Thermostat (5/–)	18½	18½	13/9	..	6 14 6
British Vac. Cleaner (5/–)	12½	10	10/–	..	5 0 0
Brush Ord. ..	Nil	Nil	4/6	..	—
Callender's ..	15	15	72/6	..	4 2 9
Chloride Elec. Storage	15	15	75/–	..	4 0 0
Cole, E. K. (5/–) ..	Nil	7	11/3	+6d.	3 2 2
Consolidated Signal	17	17	77/6	..	4 7 8
Crabtree (10/–) ..	17½	17½	29/6	..	5 18 8
Crompton Parkinson Ord. (5/–) ..	30	20	22/6	..	4 9 0
E.M.I. (10/–) ..	Nil	6	13/9	..	4 7 3
Electric Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord.	16½	12½	55/–	..	4 11 0
Elect. Switchgear (10/–)	16	10	20/–	..	5 0 0
English Electric ..	10	10	38/9	..	5 3 0
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)..	25*	22*	41/3xd	+9d.	2 13 3
Ever Ready (5/–) ..	40	40	31/–	..	6 9 0
Falk Stadelmann ..	7	7½	22/–	..	6 16 4
Ferranti Pref. ..	7	7	27/6	..	5 1 10
G.E.C.:					
Pref.	6½	6½	33/9	..	3 17 2
Ord.	20	17½	81/3	..	4 6 1
Greenwood & Batley	15	13	27/6	..	9 9 0
Hall Telephone (10/-)	15	10	16/3	..	6 3 1
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	22/6	+⅛	4 0 0
Hopkinsons ..	15	15	46/3	–9d.	6 9 10
India-Rubber Pref.	5½	5½	21/3	..	5 3 6
Intl. Combustion ..	32½	30	107/6	..	5 11 6
Johnson & Phillips	15	15	60/–	..	5 0 0
Lancashire Dynamo	20	20	66/3	..	6 0 10
Laurence, Scott (5/-)	15	15	11/–	..	6 16 4
London Elec. Wire	7½	7½	28/3	..	5 6 2
Lucas, J.	15	15	67/–	..	4 9 9
Mather & Platt ..	10	10	38/9	–9d.	5 3 3
Metropolitan Elec. Cable Pref. ..	5½	5½	21/3	..	5 3 6
Murex	20	20	87/6	..	4 11 4
Pye Deferred (5/-)..	25	25	15/–	..	8 6 8
Revo (10/–) ..	5	20	25/7½	..	7 16 0
Reyrolle	12½	12½	57/6	..	4 7 0
Siemens Ord. ..	7½	7½	26/3	..	5 14 3
Smith, S. (1/–) ..	50	37½	7/–	..	5 7 2
Strand Elec. (5/–)..	2	4	3/3	–3d.	6 3 1
Switchgear & Cowans (5/–).. ..	10	15	10/–	..	7 10 0
T.C.C. (10/-) ..	Nil	5	11/3	..	4 9 0
T.C. & M.	10	10	40/–	+6d.	5 0 0
Telephone Mfg. (5/-)	9	9	9/–	..	5 0 0
Tube Investments	23¾	20	82/–	..	4 17 7
Vactric (5/–) ..	4	Nil	5/3	+3d.	—
Vickers (10/–) ..	10	10	15/9xd	–3d.	6 7 1
Ward & Goldstone (5/–)	20	20	19/–	..	5 5 3
Westinghouse Brake	10	10	47/6	..	4 4 2
Walsall Conduits (4/-)	55	55	32/6	..	6 15 4
West, Allen (5/-) ..	7½	7½	5/9	..	6 10 5

* Dividends are paid free of Income Tax.

Stocks & Shares (*Continued from page* 447)

Globe Telegraph & Trust ordinary and preference are unchanged at 25s. On the ordinary shares, a quarterly dividend has been declared of 1 per cent. net, against 1¼ per cent. this time last year. Associated Electrical ordinary remain at 45s. The profit of £418,240 is £35,000 down, equivalent to 4.9 per cent. Telephone Properties are a dull market at 8s. 9d. The company is expected to pass the ordinary dividend for 1941. E. K. Cole continue their rise, and at 11s. 3d. are 6d. higher. Telegraph Constructions strengthened to 40s., and British Insulated to 93s. 9d. Ericssons at 41s. 3d. have recovered the dividend recently deducted. Demand for gilt-edged stocks is reflected in a gain of 2 points in Southern Railway, 5 per cent. preference which now stands at 110½.

A Taxation Anomaly

Wednesday's annual meeting of the Automatic Telephone & Electric Co. was held at Liverpool. In the statement circulated with the directors' report, the chairman protested against the manner in which income tax procedure imposes hardship upon a good many industrial companies. He quoted, as an example of what can happen, the case of a subsidiary company with an E.P.T. "loss" standard. This loss must be paid annually, plus 100 per cent. of profits earned, even if it bankrupts the subsidiary in one, two or three years, as the case may be: a result which could not have been foreseen when the Act was drafted. Its penalising effects have the direct result of hampering the war efforts of shareholders, managements and workers alike. Maybe the forthcoming Budget will contain some provision for meeting such hard cases.

A Dividend Departure

A new departure in the way of dividend-cheques is seen in the payments just made by one of the leading electricity supply companies. The cheque contains figures only: the amount is not written in words. A shareholder called at the office of the company, and asked whether this might not be open to objection. He was informed that the directors had carefully considered the matter and, with a view to economy, had decided to omit the writing in words of the amount of the dividend.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

18034. "Electrical phase or time delay indicating or controlling circuits." A. D. Blumlein. June 21st, 1939. (543602.)

1940

2713. "Distribution boxes for electric cables." G. M. Vermeer. March 11th, 1939. (543670.)

5922. "Bipolar electrolysers for the production of hydrogen and oxygen." Maschinenfabrik Oerlikon. November 3rd, 1939. (543671.)

6422. "Method of, and apparatus for, reproducing a television picture with a cathode-ray tube and separate light source." Ges. zur Forderung der Forschung auf dem Gebiete der Technischen Physik an der Eidgenossischen Technischen Hochschule. December 9th, 1939. (Addition to 543485.) (543565.)

8779. "Ceramic insulators." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken.) May 16th, 1940. (Convention date not granted.) (543568.)

8836. "Control mechanism of wireless receivers." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken.) May 17th, 1940. (Convention date not granted.) (543639.)

8943. "Electric-discharge tubes utilising electron beams controlled by deflection." Mullard Radio Valve Co., Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken.) May 20th, 1940. (Convention date not granted.) (543640.)

8945. "Incandescent electrodes for electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken and J. E. Pollak (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). May 20th, 1940. (Addition to 484548.) (Convention date not granted.) (543641.)

9075. "Kinematograph projectors." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). May 22nd, 1940. (Convention date not granted.) (543569.)

9202. "Wire seals, particularly for use in incandescent lamps and discharge tubes. Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). May 24th, 1940. (Convention date not granted.) (543570.)

9366. "Power control circuit arrangements particularly for filament heating for electronic valves." Marconi's Wireless Telegraph Co., Ltd., and R. H. Burdick. May 28th, 1940. (543545.)

9411. "Electric-discharge devices." Westinghouse Electric International Co. June 13th, 1939. (543571.)

9514. "Device comprising artificially cooled blocking-layer electrode systems." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). May 30th, 1940. (Convention date not granted.) (543572.)

9703. "Wireless receiving sets." Philips Lamps, Ltd. June 5th, 1939. (543574.)

10377. "Wireless transmitting or receiving sets." Philips Lamps, Ltd. June 17th, 1939. (543576.)

11524. "Circuit arrangements of the type comprising a thermionic valve for combating electrical oscillations." Philips Lamps, Ltd. July 13th, 1939. (543580.)

12289. "High-tension bushing." Boucher Inventions, Ltd. July 29th, 1939. (543581.)

12610. "Electro-magnetically driven hydraulic pump comprising an oscillating pump membrane and operating according to the principle of resonance." J. Szentgyorgyi and E. Pathy. August 5th, 1940. (543583.)

13167. "Piezo-electric devices." Brush Crystal Co., Ltd. September 11th, 1939. (543611.)

13674. "Metal rectifier assemblies." Standard Telephones & Cables, Ltd., E. A. Richards and L. J. Ellison. August 31st, 1940. (543589.)

13693. "Distance measuring device." Siemens-Schuckert (Great Britain), Ltd., and E. A. J. Tunnicliffe. August 31st, 1940. (543591.)

13694. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. August 31st, 1939. (Addition to 541477.) (543592.)

13754. "Frequency multiplier valve circuit arrangements." Marconi's Wireless Telegraph Co., Ltd. September 1st, 1939. (543550.)

13757. "Cathodes for electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. August 31st, 1939. (543595.)

13797. "Generation of high-tension current for electrically charged fences and the like." Lord Forres. September 3rd, 1940. (543598.)

13799. "Control of fluid compressor systems." Westinghouse Brake & Signal Co., Ltd., A. G. Kershaw and A. W. Simmons. September 3rd, 1940. (543599.)

13857. "Telegraph transmitting apparatus." Creed & Co., Ltd., and R. G. Griffith. September 4th, 1940. (543616.)

13859. "Tell-tale devices for telegraph systems." Creed & Co., Ltd., and R. G. Griffith. September 4th, 1940. (543617.)

13937. "Solenoid-operated electric vibrators." Standard Telephones & Cables, Ltd., and W. H. M. Hellier. September 6th, 1940. (Addition to 541817.) (543679.)

14450. "Thermostatically controlled water heaters." Royles, Ltd., and A. G. Royle. September 23rd, 1940. (543622.)

15431. "Permanent magnets for electrical measuring instruments." Westinghouse Electric International Co. November 4th, 1939. (543683.)

15994. "Method and means for remote detection of bombs and fire." K. Warner-Jones and Philco Radio & Television Corporation of Great Britain, Ltd. November 1st, 1940. (543629.)

16088. "Non-sludging electrical insulating oil." British Thomson-Houston Co., Ltd. (Tokyo Shibaura Denki Kabushiki Kaisha). November 5th, 1940. (543552.)

16127. "Electrical testing apparatus." E. S.

Conradi and R. A. Gale. November 5th, 1940. (543660.)

16170. "Suction cleaners." Hoover, Ltd. (Hoover Co.). November 6th, 1940. (Addition to 543470.) (543630.)

16914. "Electric protective arrangements for sectionalised supply systems." British Thomson-Houston Co., Ltd. November 25th, 1939. (543,684.)

17236. "Reflectors for electric lamps or heaters." R. R. Hoare. December 4th, 1940. (Cognate application 946/41.) (543663.)

17537. "Apparatus for automatic control of power factor of an electric circuit." A. Nemet. December 11th, 1940. (543686.)

17731. "Phase-balance condition electro-responsive devices." British Thomson-Houston Co., Ltd. December 16th, 1939. (543687.)

18102. "Protective arrangements for high-frequency communication systems." Standard Telephones & Cables, Ltd. January 3rd, 1940. (543689.)

18196. "Electron-discharge apparatus." British Thomson-Houston Co., Ltd. December 29th, 1939. (543666.)

18205. "Electro-magnetic sewing-machines." W. C. Fairweather (Singer Manufacturing Co.). December 30th, 1940. (543637.)

1941

212. "Electric circuit-breakers having overload release devices." British Thomson-Houston Co., Ltd. January 5th, 1940. (543692.)

2031. "Centrifugal electric switches." Westinghouse Electric International Co. February 16th, 1940. (543697.)

10601. "Electric thermal switches." Bulpitt & Sons, Ltd., and W. H. Bulpitt. August 20th, 1941. (543699.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—SYDNEY COUNTY COUNCIL.—April 30th. Steam and feedwater piping for No. 10 turbo-alternator at Bunnerong (Specification 559; time extended from January 29th).

Chanctonbury.—April 28th. Rural District Council. Automatic electrically operated water pumping machinery consisting of two borehole units and two high-lift units, each to deliver about 35,000 gal. per hour, and other ancillary equipment. Specifications obtainable up to April 14th from the consulting engineers, Howard Humphreys & Sons, 7, Eldon Square, Reading.

Manchester.—April 7th. Electricity Department. One 500-kW, 6,600/210 V, AC (three-phase)/DC (two-wire) motor generator or motor convertor and starting equipment, and low-pressure pipework, supports, etc., together with one steel storage tank (March 20th).

South Africa.—DURBAN.—April 17th. City Council. 3,300-V switch cubicles (Contract E.2045).

May 15th. Turbo-generator sets, switchgear and Diesel-engined starting set (Contract W.45/US).

JOHANNESBURG.—April 22nd. Railways and Harbours. Portable electric lighting sets. (Contract 3586.) Tender time extended.

April 29th. Insulated wire (Contract P.S. 6070).

April 30th. Cable (Contract P.S.6071).

PIETERMARITZBURG.—May 7th. City Council. Cables (Contract 204); lamps (205); poles (206); fuse boxes (207); wire (208); switchgear (209); and transformers (210).

SALISBURY.—April 13th. City Council. Distribution materials (Contract E.15).

May 18th. Cable and conductor (Contract E.17).

BULAWAYO (S. RHODESIA).—May 20th. Municipality. Meter testing equipment (Contract E.13/1942).

KENHARDT.—June 24th. Municipality. Plant for electricity supply undertaking.

UPINGTON.—June 24th. Municipality. Electric plant (alternator, switchboard, meters, crude oil engine, etc.).

Orders Placed

Kettering.—Borough Council. Accepted. One 6,600-V, 250,000-kVA duplicate busbar, solenoid operated, metalclad switch unit (Spec. 97).—Metropolitan-Vickers Electrical Co., Ltd. Two 11,000-V, 150,000-kVA duplicate busbar, solenoid operated metalclad switch units and one neutral switch pillar (Spec. 98).—English Electric Co., Ltd. One 4,000-kVA transformer (Spec. 99)—British Electric Transformer Co., Ltd.

London.—ST. MARYLEBONE.—Electricity Committee. Contracts for meters extended for three years.—Chamberlain & Hookham, Ltd.; Ferranti, Ltd.

ST. PANCRAS. Special Emergency Committee. Accepted. Replacement of an electric battery in refuse collecting vehicle (£142 less £8 allowance for old battery).—Edison Swan Electric Co.

Two soot blowers for boiler (£81).—Diamond Blower Co., Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ancoats.—Works extensions; Peace & Norquoy, Ltd., builders, New Islington Works, Manchester, 4.

Blackburn.—Reinstatement of factory buildings; Isolatt Cork Co., Ltd., Victoria Mills, Percy Street.

Brampton.—Canteen at colliery; Miners' Welfare Commission, Ashley House, Ashtead, Surrey.

Brighouse.—Repair workshop; Belle Vue Garage Co., Bradford Road.

Foundry, River Street; J. Blakeborough & Sons, Woodhouse Works.

Broadheath.—Alterations to works; F. J. Hampson, coir matting manufacturer, Atlantic Street.

Broughton.—Additions, Kelstree clothing factory; Kays (Manchester), Ltd., 57, Dale Street, Manchester.

Factory extensions; P. Hamer, Ltd., building contractors, 15, Park Street, Swinton, Manchester.

Caernarvonshire.—Canteen at Llanfairfechan National Schools; W. Ll. Jones, county architect, County Offices, Shirehall Street, Caernarvon.

Cheetham.—Rebuilding offices and warehouse; Drury & Gomersall, architects, 11, Imperial Buildings, Oxford Road, Chorlton-on-Medlock, Manchester.

Croydon.—Reconstruction of block at Warlingham Park Hospital; E. Taberner, clerk to the Committee, Town Hall, Croydon, Surrey.

Davyhulme.—Bungalows; J. H. Bird, 29a, Bent Lanes, Davyhulme, Manchester.

Gaythorne.—Works extensions; McCutcheon & Walsingham, architects, 1180, Chester Road, Stretford.

Glasgow.—Farm school, Lawmuir estate; W. Kerr, town clerk, City Chambers.

Greenock.—Completion of houses; burgh surveyor.

Halesowen.—British Restaurant at Hill and Cakemore; J. Harper & Sons, builders, Blackheath, Birmingham.

Harrow.—Building, College Road, for British Restaurant; U.D.C. surveyor, Council Offices, Uxbridge Road, Stanmore.

Hebburn-on-Tyne.—Wartime nursery school; D. Glen, contractor, Back Queen's Road, Jarrow-on-Tyne.

Llanfairfechan.—Extensions to fire station; J. Ellis, surveyor, Council Offices, Llanfairfechan.

London.—WANDSWORTH.—New building and adapting existing building, Queen Mary's Hospital, Putney; Nicholas and Dixon Spain, architects, 19, Hanover Square, W.1.

Longbenton.—British Restaurant at Dudley; G. McNaught, surveyor, U.D.C. offices, Longbenton, Northumberland.

Longsight.—Works extensions; W. Gornall & Sons, Ltd., building contractors, Gore Street, Salford,3.

Manchester.—Works canteen, Wilson Street; R. Carlyle & Co., Ltd., building contractors, Old Trafford.

Newcastle-on-Tyne.—British Restaurant in New Bridge Street; E. Thompson, 12, Grey St.

Northumberland.—Charlton Hall, near Alnwick, to be converted into a remand home for boys; county architect, Mitford Road offices, Morpeth.

Openshaw.—Works additions; F. Goodyear & Sons, Ltd., builders, Albion Works, Abbey Hey Lane, Gorton, Manchester.

Works extensions; G. & W. Smith (builders), Ltd., Hyde Grove, Manchester,12.

Works additions; H. F. V. Newsome, architect, 42, Tatton Road South, Heaton Moor, Stockport.

Preston.—Canteen; Goss Printing Works, Ltd., Greenbank Street.

Extensions to Fulwood and Cadley Council Schools; A. Evans, county architect, Lancashire County offices, Preston.

Rugeley.—Church at Etching Hill; Rev. A. C. Ainsworth, The Vicarage, Rugely, Staffs.

South Hetton (Co. Durham).—Canteen at colliery; E. M. Lawson, Barras Buildings, Barras Bridge, Newcastle-on-Tyne.

Stirling.—Nurseries at Kildean and St. Ninians; town clerk, Municipal Buildings.

Taunton.—Erection of restaurant and kitchen; East Reach; borough engineer, St. Paul's House.

Urmston.—Community hall; E. L. Leeming, surveyor, Council Offices, Crofts Bank Road, Urmston, Manchester.

Waterhead.—Canteen, Orb Cotton Mill; Ogden Bros., builders, 849, Middleton Road, Oldham.

West Ham.—Maternity accommodation at Whipps Cross Hospital (£1,440); borough engineer.

TRADE MARK APPLICATIONS

THE following applications for British trade marks have been made. Objections may be entered within a month of March 25th.

ACME (design). No. 617052, Class 1. Rubber solution. Also No. 617053, Class 17. Insulating tape not containing or prepared with shellac. —Industrial Insulations, Ltd., Works Road, Letchworth.

ASEA. No. 613,673, Class 12. Electrically operated land and water vehicles and electrically operated component parts (not included in other classes) of land and water vehicles.—Asea Electric, Ltd., Fulbourne Road, Walthamstow, London, E.17.

MINERVA (design). No. 617328, Class 17. Varnishes and compounds, all for electrical insulating purposes.—Pinchin, Johnson & Co., Ltd., 4, Carlton Gardens, London, S.W.1.

DURACOTT and DURATUBE. Nos. 617546 and 617547 respectively, Class 17.—Duratube & Wire Ltd., 16, Hanworth Road, Feltham.

Transformers for Liffey Scheme

ON March 18th a 60-ton transformer arrived at Poulaphouca (Liffey scheme), having completed its journey from London. Electricity Supply Board engineers have commenced its installation which will be completed within a month. A second transformer is due soon and after its installation it will be possible to put the Liffey scheme into temporary commission. The work of the Cementation Company which erected the buildings is on the eve of termination, and houses for the permanent engineers are nearing completion.

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